INTERIM ACTION WORK PLAN
OU16 SITE IMPROVEMENTS

For:
FORMER DIAMOND SHAMROCK
PAINESVILLE WORKS SITE

Located at:
PAINESVILLE, OHIO

Prepared for:
PAINESVILLE PRP GROUP
1897 FAIRPORT NURSERY ROAD
PAINESVILLE, OHIO

OCTOBER 2006 (REVISED)

Hull & associates, inc.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

October 19, 2006

Paul Dugas
Tierra Solutions
P.O. Box 1487
Painesville, OH 44077

Dear Mr. Dugas:

Thank you for your October 11, 2006 letter providing replacement pages for the August 2006 "Interim Action Work Plan OU 16 Site Improvements" (Work Plan) for the Diamond Shamrock Site in Painesville, Ohio (the Site). The U.S. Environmental Protection Agency (EPA) hereby approves the Work Plan, as amended by the replacement pages.

EPA appreciates your prompt response and resolution of the outstanding EPA comments regarding the Work Plan. If you have any questions concerning this letter, please contact me at (312) 886-4742.

Sincerely,
Brad Bradley
Remedial Project Manager

cc: Teri Heer, Ohio EPA
Bob Kay, USGS

Painesville PRP Group
P.O. Box 188
Painesville, Ohio 44077-0188
(440) 350-9902

October 11, 2006

Mr. Brad Bradley
US EPA
Region 5
77 West Jackson Blvd.
Chicago, IL 60604-3590

Re: Response to USEPA Comments Letter, TIE016.600.0020.

Dear Mr. Bradley:

Tierra Solutions (Tierra) and Hull & Associates, Inc. (Hull) received a comments letter dated 9/7/06 from US EPA regarding the August 2006 Interim Action Work Plan OU 16 Site Improvements (Work Plan) for the Diamond Shamrock Site in Painesville, Ohio. This letter responds to US EPA's comments by reproducing those comments in full, followed by our response. The original US EPA comment numbers and item letters are shown. A list of attachments to this letter is appended.

U.S. EPA Comment 1. The main issue, whether or not there will be substantial removal of cap material, has been addressed. EPA is still confused on a couple of issues. The text on page 6 seems to indicate that:

a. at the end of the day the thickness of the clay cap (which is separate from the additional clay material that will be placed on top of the cap) over the ENTIRE OU16 will be at least 24 inches.

b. Borrow material for the regrading will be existing clay cap material from areas of the cap with more than 5 ft of clay cap thickness.

c. The areas used for borrow material will have at least 2.5 ft of clay cap material remaining when the regrading is finished.

d. It is anticipated that the actual area that will be subjected to substantial regrading will be fairly small.

Assuming this is correct, this means that areas that currently have as much as 10 ft of clay cap may have as little as 2.5 ft of clay cap (again, which is distinct from the additional clay material to be placed above the cap) when the regrading is finished. It's also unclear that areas that have say 3 ft of cap will wind up with more cap material or the same amount (on the whole). Again, this is not fatal to reducing infiltration overall—particularly if the area used for borrow is small—but it appears to be a step in the direction of increasing infiltration in at least some areas of OU16 with no clear indication of offsetting decreases in other areas. Please add text to clarify these statements and provide proof that the overall infiltration is not compromised by the actions contemplated of OU16.

Response to U.S. EPA Comment 1:
The regrading by use of existing cap material will consist of approximately 8,000 cubic yards (cy) of material out of a total of approximately 480,000 cy. The vast majority of the material to be used to build up the cap, 472,000 cy, will come from off-site sources. The regrading by use of the existing cap material will account for less than 2% of the total earthwork. All areas of the existing cap will be left with a minimum of two feet of existing clay cap, and the landfill area will receive more clay as described below.

Additional low permeability clay material will be added to the existing, regraded cap to provide an additional decrease in infiltration across the existing cap. HELP model analyses indicate that a minimum of a 6-inch layer of clay material with an average, in-place, vertical permeability of $1x10^{-7}$ centimeters per second (cm/s) combined with sand cap drainage features will provide an overall decrease in infiltration over the current infiltration experience by the existing clay cap. Although more than six inches of additional clay material may be added to some areas, the model was performed using the 6-inch minimum thickness. Thus, the exiting clay cap system will not be compromised and instead, the proposed system will provide improvements to the current system, even taking into account that some areas will realize a cut in the depth of the clay layer.

Section 2.1, Section 3.1, and Section 3.2 of the Work Plan have been updated to reflect this information. Red-line versions of the pages that changed are provided in Attachment 1 for your review. Clean versions of these revised pages are provided in Attachment 2 for replacement in the August 2006 (REVISED) version of the Work Plan.

U.S. EPA Comment 2. This comment has been adequately addressed. It is now clear than the drains will penetrate the "clay material: to be placed over "cap" but will not penetrate the original cap. Will the backfill for the drains and pipes by silt/clay? Or sand? If sand, this means that parts of the landfill cover will have a maximum of about 24 inches of clay, which should be figured into the proposed HELP model.

Response to U.S. EPA Comment 2:
It was anticipated that granular backfill (e.g., sand) would be used for all drain pipe installation. Therefore, the maximum clay thickness of 24 inches was used to evaluate the infiltration potential of the proposed cap improvements.

U.S. EPA Comment 3. This comment has been adequately addressed in the response to comments. However, there is nothing in the Work Plan that explicitly discusses drainage from the sand traps.

Response to U.S. EPA Comment 3:
Sand traps, tees, fairway low spots, and all other features of the golf course will be drained either directly by virtue of a catch basin, or indirectly through the use of the sand cap and radial, sub-grade drainage system as described in Section 2.2 of the Work Plan. Section 3.3 of the Work Plan has been updated to reflect this information. Red-line versions of the pages that changed are provided in Attachment 1 for your review. Clean versions of these revised pages are provided in Attachment 2 for replacement in the August 2006 (REVISED) version of the Work Plan.

U.S. EPA Comment 4. This comment has not been fully addressed. It appears that at least some of the issues related to the discrepancies in the numbering between table 1 and the figure in Appendix A have been addressed, but there appear to be some remaining discrepancies between the figure and tables 1 and A-1. The figure indicates geotechnical samples were collected from boring 6005. Table 1 and A-1 do not indicate that any samples were collected from this boring. Table 1 indicates a Shelby tube sample was collected from boring 6006 (among others) and table A-1 indicates samples were collected from boring

6003 (among others), but the figure does not indicate geotechnical samples were collected from either of these holes. The boring reputed to be the locations where Shelby tube samples were collected in table 1 do not always agree with the boring locations for the test samples noted on table A-1. Because the samples tested in table A-1 were collected by use of Shelby tubes (according to p. 2 of the Work Plan), this lack of agreement between sampling locations poses a problem. These and ALL of the other discrepancies between the figure and tables need to be resolved.

Response to U.S. EPA Comment 4:
All discrepancies between Table 1, Table A-1, and the figure found in Appendix A titled "Cap Investigation Operable Unit 16 (Geotechnical)" have been resolved. Clean versions of these revised tables are provided in Attachment 2 for replacement in the August 2006 (REVISED) version of the Work Plan.

U.S. EPA Comment 5 has not been adequately addressed. Although the text of the Work Plan odes now describe that the new (extra) clay will be a minimum of 24 inches and compacted to a 10(-7) permeability, U. S. EPA's comment pertained to the assumptions involved in the infiltration modeling, which have not been addressed in the infiltration model presented in Appendix C.

In addition, U. S. EPA has a couple of comments pertaining to the revised version of the Work Plan.

Section 2.1 – perhaps U. S. EPA was given the old version of the HELP model, but the evaluation described in this section is not what was performed in Appendix C.

Section 3.2—Is bullet 3 means to mean that the permeability of the cap material will be reduced to the 10(-8) modeled?

Appendix A—again, there appear to be a number of discrepancies as to what samples were collected from what borings. U. S. EPA's read of the remodeled permeability testing is that a permeability of 10(-8) cm/s assumed in the HELP model is going to be heard to get.

Response to U.S. EPA Comment 5:
US EPA reviewer Bob Kay and representatives from Hull held a conference call on September 22, 2006 to discuss these issues. It was determined that a revised Infiltration Analysis would provide the verification that US EPA was seeking on Comment 5. The revised Infiltration Analysis includes an accurate representation of existing conditions as well as a proposed soil cross section that mirrors the landfill cap improvement construction as it is described in the text of the revised Work Plan. Bob Kay acknowledged his receipt of this revised Infiltration Analysis and his concurrence with this approach in an email to you and Mr. Matthew Montecalvo at Hull on September 22, 2006.

This revised Infiltration Analysis, as reviewed by Bob Kay, is provided in Attachment 3 for your use. The attached version of the Infiltration Analysis should replace all previous versions of the Infiltration Analysis.

We understand that these modifications will fulfill US EPA requirements. We are prepared to implement Work Plan activities immediately upon approval by the regulatory agencies.

Respectfully submitted,

for Paul J. Dugas
Tierra Solutions, Inc.

cc: Teri Heer, Ohio EPA
Dave Rabbe, Tierra Solutions, Inc.
Todd Davis, Hemisphere Corporation
Teresa Jordan, TERSCO Environmental Consulting
Bill Beach, Hull & Associates Inc.

List of Attachments:

Attachment 1	Red-line Pages of Work Plan Text
Attachment 2	Clean Replacement Pages of Work Plan Text (Including revised Tables and Figures)
Attachment 3	Revised Infiltration Analysis

ATTACHMENT 1

Red-line Pages of Work Plan Text

INTERIM ACTION WORK PLAN
OU16 SITE IMPROVEMENTS

For:
FORMER DIAMOND SHAMROCK
PAINESVILLE WORKS SITE

Located at:
PAINESVILLE, OHIO

Prepared for:
PAINESVILLE PRP GROUP
1897 FAIRPORT NURSERY ROAD
PAINESVILLE, OHIO

OCTOBER 2006 (REVISED) Deleted: AUGUST 2006

1.0 INTRODUCTION

The Ohio Environmental Protection Agency issued Director's Final Findings and Orders (DFFO) for a Remedial Investigation/Feasibility Study (RI/FS) at the former Diamond Shamrock Painesville Works Site (Site) on September 27, 1995. The Site was subdivided into seven distinct study areas based on historical activities conducted in each area during plant operations. As a part of the FS process, the Site was divided further into twenty-two Operable Units (OUs). The Interim Action Work Plan (IAWP) describes the proposed improvements to OU16 (also known as the chrome landfill).

1.1 General Site Description

The Diamond Shamrock Painesville Works site is an approximately 1,100-acre former chemical manufacturing facility located in Lake County, Ohio (Figure 1). The Diamond Shamrock Painesville Works facility operated from 1912 through 1977 and manufactured a variety of products including, but not limited to, soda ash, baking soda, chromium compounds, carbon tetrachloride, hydrochloric and sulfuric acids, chlorinated wax, and coke.

OU16 is located in the south central portion of the Site and is the site of a former Solvay settling basin and chromite ore processes residue (COPR) disposal site. Following cessation of manufacturing operations, OU16 was permitted as a fly ash landfill and received as much as 740,000 cubic yards of fly ash. Following disposal of fly ash at the site, a clay cap was constructed over the landfill to prevent contact with both the fly ash and COPR. Currently, the landfill is covered with grass and regularly mowed.

Deleted: s

1.2 Site-Wide Redevelopment

The entire former Diamond Shamrock Painesville Works Site is being redeveloped by Hemisphere Corporation (Redeveloper) into a destination, resort community that will include public and private access spaces for sports-oriented vacationers and permanent residents. OU16 will be an active part of this redevelopment, with several golf holes and golf practice areas located on top of the cap. The improvements proposed for the OU16 site will contribute to the overall aesthetic improvement of the development, as well as improve the performance of the landfill cap.

1.3 Summary of Existing Cap System

Closure activities were implemented under an Administrative Consent Order (ACO) between U.S. EPA and Diamond Shamrock Chemical Corp. dated 1983, which included the placement of fly ash on the site followed by a clay cap. There are no design or "as-built" drawings of the existing cap system. Information regarding the design and construction of the landfill was obtained from a geotechnical investigation performed in January 2006 (Hull, 2006). The investigation consisted of installing 42 soil borings drilled into the clay cap until the underlying fly ash was encountered. The results of the investigation determined that the thickness of the clay cap ranged from 1.4 to 10.5 feet below existing ground surface with an average thickness of 4.2 feet. In general, a thicker clay cap was present in the southern portion of OU16 near the slope along the Grand River. A report of this geotechnical investigation is included in Appendix A. A schematic of the existing cap cross-section is presented on Figure 2.

Deleted: 2

Deleted: 3

The predominant soil type of the cap is described as grey lean clay with sand and grey sandy lean clay with a Unified Soils Classification System (USCS) designation of CL. This clay meets Ohio EPA requirements for clay landfill cap material. Permeability tests were also conducted on the clay cap material. Five in-situ samples of clay cap material were collected using thin-walled Shelby-tubes. These samples were tested using ASTM D1557 for vertical permeability. Results of the analysis indicated that the material meets the Ohio EPA recommended maximum permeability of 1.0×10^{-7} cm/sec to be considered as an acceptable low-permeability cap. The existing cap also effectively prevents surface receptor populations from exposure to fly ash and chromium residuals.

1.3.1 Environmental Assessment of Landfill Cap Material

A total of eight environmental soil samples were collected from the clay cap as part of the geotechnical investigation conducted during January 2006. These samples were submitted for laboratory analysis of target analyte list (TAL) metals including cyanide and hexavalent chromium, Target Compound List (TCL) VOCs, TCL SVOCs, TCL pesticides, TCL polychlorinated biphenyls (PCBs), oxidation-reduction potential (ORP) and total organic carbon (TOC). Analytical results from the investigation are included in Appendix B.

Following the approved screening process, only one chemical of concern (COC) (manganese) is identified in the clay cap soils. Tables 1 through 4 summarize the approved COC screening process. The maximum concentration of manganese is 560 mg/kg. The screening criterion for

2.0 CAP SYSTEM IMPROVEMENTS

The planned improvement for OU16 consists of constructing golf course holes over the landfill. A proposed layout for the golf course is shown on Figure 3. Such improvements will turn the landfill into usable land as part of the overall development plan for the Site. No work will be conducted in any area of OU16 as part of this Interim Action except for the landfill cap area.

The performance of the landfill cap as a barrier to infiltration also will be improved. Specifically, a drainage system will be installed according to the golf course design specifications that will reduce infiltration of storm water runoff into the compacted clay cap.

2.1 Clay Cap Improvement

The landfill is currently capped by various thicknesses of clay, ranging from 1.4 feet to 10.1 feet in thickness. An infiltration analysis was performed using the Hydrologic Evaluation of Landfill Performance (HELP) model to evaluate the effectiveness of the proposed cover system by comparing the infiltration through the cap system before and after redevelopment. The basis for the existing cap configuration model was an average vertical permeability of 2.4×10^{-7} centimeters per second (cm/s) and an average cap thickness of four (4) feet as determined by Hull's geotechnical investigation of the cap.

Using the soil properties determined from the January 2006 geotechnical evaluation and conservative golf course irrigation estimates, it was determined by use of the HELP model that a minimum thickness of existing landfill cap material of 24 inches across the entire landfill cap area (at the current, average permeability of 2.4×10^{-7} cm/s) overlain by a minimum thickness of six inches of compacted clay across the entire landfill cap area (having an average, in-place, vertical permeability of 1.0×10^{-7} cm/s), overlain by a variable thickness varying clay thicknesses of clay having a vertical permeability of 1×10^{-7} cm/s additional clayey soils, and finally covered by 6 to 12 inches of sand (modeled as 8 inches), topped with vegetation, would offer better performance than the existing clay cap alone. A summary of this infiltration analysis is provided in Appendix C. A cross-section of the proposed cap improvements is presented on Figure 2.

Formatted: Superscript

Formatted: Superscript

Deleted: the

2.2 Drainage System

The storm water collection system will consist of numerous catch basins, shown on Figure 3, located within the boundaries of the landfill. The catch basins will be connected to small

3.0 CONSTRUCTION OF CAP IMPROVEMENTS

Both physical and aesthetic improvements are planned for the landfill area of OU16. These improvements include grading the existing compacted clay cap to a minimum thickness of 24 inches over the entire landfill and then overlaying the clay cap with additional clayey soils followed by a sand-based drainage layer. The additional clayey soil placed over the landfill cap will provide additional protection of the landfill cap materials, improve the performance of the cap system, and improve the aesthetic quality of the landfill for its end-use as a golf course.

3.1 Summary of System Improvements

Improvements to the OU16 clay cap containment system include:

1. Re-grading and compacting the existing clay cap to no less than 24 inches in thickness;
2. Placement of a minimum of six inches of clay soils having an average, in-place, vertical permeability of $1x10^{-7}$ cm/s over the entire landfill area;
3. Placement of a varying amount of clayey soils over the clay cap;
4. Installation of a drainage system over the entire landfill area;
5. Placement of 6 to 12 inches of sand over the clayey soils over the entire landfill area; and
6. Spreading of seed and other shallow-root vegetation to establish the vegetative cover for the golf course over the entire landfill area.

Deleted: G

Formatted: Bullets and Numbering

Formatted: Superscript

Deleted: up to 24 inches

Deleted: of additional

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

3.2 Installation of Improvements

Existing vegetation will be scalped from the surface of the landfill to a maximum depth of four inches. This work will provide a working surface to aid in grading of the site and making the surface capable of accepting the additional clay fill. A small amount of regrading of the existing cap system will be performed following the scalping activities. This is estimated to be approximately 8,000 cubic yards, compared to an estimated 472,000 cubic yards of clay to be imported from off-site. Generally, material to be removed from the existing landfill cap horizon will be limited to areas where the existing landfill cap thickness exceeds 5 feet. The minimum planned thickness of clay in these areas following regrading of the clay will be 24 inches. Following completion of grading activities, additional clean clay material will be imported and placed such that and overall 1 x 10^{-7} cm/s is achieved over the entire OU prior to the installation

Deleted: M

Deleted: 2.5 feet

of the on-site drainage system. Imported soil fill will be appropriately characterized prior to construction to ensure that risk goals for the intended recreational end-use can be met.

The installation sequence for the improvements is as follows:

1. Implementing a Storm Water Pollution Prevention Plan (SWP3)/Best Management Practices (BMP) measures to be maintained during construction
2. Scalping of grass and other vegetation from the OU;
3. Cutting, grading, and re-compacting approximately 8,000 cubic yards (cy) of the existing clay cap to meet landfill cap performance specifications (this accounts for less than 2% of the total earthwork to be performed during installation of cap improvements);
4. Placement of a minimum of six inches of compacted, clay soil that will achieve an average, in-place, vertical permeability of 1×10^{-7} cm/s;
5. Placing a varying amount of imported clayey soils compacted to achieved overall permeability of 1×10^{-7} cm/s over the clay cap as per the contract drawings to meet design grades;
6. Installing stormwater collection system. Trenches will not penetrate the existing, 24-inch minimum clay cap. Pipes will be sloped for proper gravity drainage. Leakage testing will be performed prior to backfilling of the trenches;
7. Placement of 6 to 12 inches of sand over the clayey soils; and
8. Seeding of all disturbed surfaces, removal of temporary SWP3 controls, and performance of final site clean up.

Approximately 472,000 cubic yards of additional fill material will be needed to achieve cap improvements. Items 4 and 5 account for the balance of imported fill brought to OU16.

3.3 Additional Golf Course Construction Activities

Final golf course construction activities will include the shaping of greens and tees and the installation of a golf course irrigation system. All golf course construction components and activities will be completed above the minimum 24-inch thickness of the existing cap. The drainage system discussed in Section 3.2 is being installed to provide additional drainage capacity to the landfill cap. This drainage system is inclusive of the golf course area. Sand traps, tees, fairway low spots, and all other features of the golf course will be drained either directly by means of a catch basin or indirectly though the use of the sand layer and radial, sub-grade drainage system as described in Section 2.2.

Deleted: of

Deleted: ¶

Deleted: (as needed)

Formatted: Bullets and Numbering

Formatted: Superscript

Formatted: Bullets and Numbering

Deleted: of up to 24 inches

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Report Nrml

Deleted: ¶

Formatted: Report Nrml, Indent: Left: 0"

Deleted: ¶

ATTACHMENT 2

Clean Replacement Pages of Work Plan Text (Including revised Tables and Figures)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

September 7, 2006

Paul Dugas
Tierra Solutions
P.O. Box 1487
Painesville, OH 44077

Dear Mr. Dugas:

Thank you for the opportunity to review the August 2006 "Interim Action Work Plan OU 16 Site Improvements" (Work Plan) for the Diamond Shamrock Site in Painesville, Ohio (the Site). The U.S. Environmental Protection Agency (EPA) has the following comments regarding the Work Plan, which follow the same order as our July 10, 2006 letter to you:

U.S. EPA comment 1. The main issue, whether or not there will be substantial removal of cap material, has been addressed. EPA is still confused on a couple of issues. The text on page 6 seems to indicate that:

a. at the end of the day the thickness of the clay cap (which is separate from the additional clay material that will be placed on top of the cap) over the ENTIRE OU16 will be at least 24 inches.

b. borrow material for the regrading will be existing clay cap material from areas of the cap with more than 5 ft of clay cap thickness.

c. the areas used for borrow material will have at least 2.5 ft of clay cap material remaining when the regrading is finished.

d. it is anticipated that the actual area that will be subjected to substantial regrading will be fairly small.

Assuming this is correct, this means that areas that currently have as much as 10 ft of clay cap may have as little as 2.5 ft of clay cap (again, which is distinct from the additional clay material to be placed above the cap) when the regrading is finished. It's also unclear that areas that have say 3 ft of cap will wind up with more cap material or the same amount (on the whole). Again, this is not fatal to reducing infiltration overall--particularly if the area used for borrow is small--but it appears to be a step in the direction of increasing infiltration in at least some areas of OU16 with no clear indication of offsetting decreases in other areas. Please add text to clarify these statements and provide proof that the overall infiltration is not compromised by the actions contemplated for OU 16.

U.S. EPA comment 2. This comment has been adequately addressed. It is now clear than the drains will penetrate the "clay material" to be placed over "cap" but will not penetrate the original cap. Will the backfill for the drains and pipes be silt/clay? or sand? If sand, this means that parts of the landfill cover will have a maximum of about 24 inches of clay, which should be figured into the proposed HELP model.

U.S. EPA comment 3. This comment has been adequately addressed in the response to comments. However, there is nothing in the Work Plan that explicitly discusses drainage from the sand traps.

U.S. EPA comment 4. This comment has not been fully addressed. It appears that at least some of the issues related to the discrepancies in the numbering between table 1 and the figure in Appendix A have been addressed, but there appear to be some remaining discrepancies between the figure and tables 1 and A-1. The figure indicates geotechnical samples were collected from boring 6005. Tables 1 and A-1 do not indicate that any samples were collected from this boring. Table 1 indicates a Shelby tube sample was collected from boring 6006 (among others) and table A-1 indicates samples were collected from boring 6003 (among others), but the figure does not indicate geotechnical samples were collected from either of these holes. The borings reputed to be the locations where Shelby tube samples were collected in table 1 do not always agree with the boring locations for the test samples noted on table A-1. Because the samples tested in table A-1 were collected by use of Shelby tubes (according to p. 2 of the Work Plan), this lack of agreement between sampling locations poses a problem. These and ALL of the other discrepancies between the figure and tables need to be resolved.

U.S. EPA comment 5 has not been adequately addressed. Although the text of the Work Plan does now describe that the new (extra) clay will be a minimum of 24 inches and compacted to a 10(-7) permeability, U.S. EPA's comment pertained to the assumptions involved in the infiltration modeling, which have not been addressed in the infiltration model presented in Appendix C.

In addition, U.S. EPA has a couple of comments pertaining to the revised version of the Work Plan.

Section 2.1--perhaps U.S. EPA was given the old version of the HELP model, but the evaluation described in this section is not what was performed in Appendix C.

Section 3.2--is bullet 3 meant to mean that the permeability of the cap material will be reduced to the 10(-8) modelled?

Appendix A--again, there appear to be a number of discrepancies as to what samples were collected from what borings. U.S. EPA's read of the remodeled permeability testing is that a permeability of 10(-8) cm/s assumed in the HELP model is going to be hard to get.

I would recommend that you call Bob Kay directly at (312) 886-7938 to work out acceptable language to resolve these comments so that the third draft Work Plan can be approved without

any required modifications. If you have any questions concerning this letter, please contact me at (312) 886-4742.

Sincerely,

Brad Bradley
Remedial Project Manager

cc: Teri Heer, Ohio EPA

Painesville PRP Group
P.O. Box 188
Painesville, Ohio 44077-0188
(440) 350-9902

August 3, 2006

Mr. Brad Bradley
US EPA
Region 5
77 West Jackson Blvd.
Chicago, IL 60604-3590

Ms. Teri Heer
Ohio EPA
NEDO
2110 East Aurora Road
Twinsburg, Ohio 44087

Re: Interim Action Work Plan for OU16 Site Improvements located at the Former Diamond Shamrock Painesville Works Site, Painesville, Ohio; TIE016.600.0017

Dear Mr. Bradley and Ms. Heer:

The Painesville PRP Group has received comments from both the Ohio EPA and the US EPA and has the following responses:

US EPA Comment #1: Section 3- EPA does not fully understand exactly what the regrading is going to entail. Parts of the text indicate that only about 4 inches of the cover will be removed then additional clay and sand material will be added from that point to reach the final grade, which seems protective. However, other parts of the text leave open the possibility that several feet of cap material may be removed from substantial areas leaving large (in comparison to current conditions) parts of the cap with only 24 inches of clay cap (as distinct from the "clayey material" that will placed on top of the cap to form the "clay layer"). For example, in section 3.2 there is the statement that "No excavation will be permitted to extend below the existing cap vertical limits...", which means that you could excavate essentially all of the cap save and inch or so. The possibility that substantial amounts of clay will be removed from much of the cap for regrading, while not necessarily fatal to ultimately reducing infiltration, is a step in the wrong direction. Please clarify the anticipated amount and extent of the excavation required for the regrading.

Response: A small amount of regrading of the existing cap system is required to achieve the overall landfill cap improvements. Material to be removed from the existing landfill cap horizon will be limited to areas where the existing landfill cap thickness exceeds 5 feet. The minimum planned thickness of clay remaining in these areas following regrading of the clay is 2.5 feet. The material removed during regrading will be relocated onto portions of the landfill cap that currently have thinner layers of clay. Additional clay material will be placed on the entire landfill to reach grades appropriate for the proposed future use. This material will be placed and compacted such that an overall permeability of 1x10-7

centimeters per second (cm/s) will be achieved. The Interim Action Work Plan (IAWP) has been revised to clarify the information provided in Section 3.

US EPA Comment #2: Section 3.2- please clarify bullet 5. Does this mean trenches will not penetrate the currently existing landfill cap? Or does this mean they will not penetrate the 24 inches of clayey soils to be placed on top of the landfill cap? Trenches installed into low permeability material that are being used as conduits for water movement risk localized infiltration if the pipes leak.

Response: *A minimum of 24 inches of undisturbed clay cap material will be present across the entire landfill. No penetrations of any kind will be permitted to extend into this 24-inch thick, undisturbed clay cap having a minimum vertical permeability of 1x10-7 cm/s. In addition to this minimum 24 inch layer, many areas of the landfill cap will have varying thickness of additional, undisturbed clay material having a minimum vertical permeability of 1x10-7 cm/s. Regardless, no trenches will penetrate the minimum 24 inches of undisturbed cap material, which will be maintained across the entire landfill cap system.*

US EPA Comment #3: Figure 3- What are the black blotches? Ponds? Trees? Sand traps? If they are ponds or sand traps they have the ability to alter the recharge of the cap. Please identify these features.

Response: *The "black blotches" on Figure 3 are sand traps. No ponds or other water hazard will be constructed on the landfill. The sand traps will be constructed entirely above the 24-inch, undisturbed, clay cap. Each sand trap will drained in a manner similar to the fairways of the golf course to prevent the ponding of water*

US EPA Comment #4: Appendix A- Comparing the boring numbers in table 1 with the locations on the boring map does not necessarily provide a straightforward comparison. The table and./or figure should be altered so that there is an unambiguous relation between the locations in the table and the figure. EPA assumes boring number 6003 on the table is boring 6-3 on the map (and so on)? If so, which boring is represented by (say) boring 6005 on the table? Boring 6005 on the map? Or boring 6-5? Where is the data for borings 6001 and 6002? If EPA's assumption about the relation between the boring numbers in the table and map is correct, most of this site appears to have a cap thickness of at least 3 ft, presumably including soil/ grass.

Comparing boring locations on table A-1 with locations for geotechnical samples shown on figure 1 also does not agree. Show where the samples were taken from on a figure, and be consistent between text, tables, and figures.

Response: *Appendix A of the IAWP has been revised to clearly identify soil boring locations and samples collected at each location.*

US EPA Comment #5: Appendix C- EPA does not have the modeling hardware to verify these results, but a couple of issues present themselves.

EPA can see the rationale for selection of the permeability values and perhaps the thickness values for the "existing system", but is unclear as to why it was assumed that the breakdown is 65 and 25 acres, and why were the specific permeability and thickness values assigned as they were? Is it because three of the four (not including the duplicate) permeability tests (75% or 67 acres) were in the 10(-7) cm/sec range and one was in the 10(-8) cm/sec range? EPA knows of nothing in Appendix A that indicates permeability values varied with cap thickness (of course, EPA can't find the location of the sampling points either, so maybe there is a relation), so why assume lower permeability is associated with thinner parts of the cap? Perhaps it would be more straightforward to assume a permeability of 4.5 x 10(-7) cm/sec and a thickness of 4 ft for the entire landfill as an average?

In terms of the "proposed system" simulation, EPA can find no rationale to assume permeabilities for the clay layer in the 10(-8) cm/sec range. Nothing in the text indicates there are plans to redesign the existing cap to a 10(-8) cm/sec permeability and nothing indicates that such a goal is uniformly achievable. These estimates appear to be essentially made up to allow for calculation of a low value of infiltration. EPA also does not understand how 10(-8) cm/sec permeability values applicable over a thickness of 3.5 ft. The work plan seems to indicate that the cap itself is to be at least (maybe uniformly) 2 ft thick, with an additional 2 ft of "clayey soils" on top of the cap, so EPA can see the rationale for assuming a total thickness of 3.5 ft. However, there is no indication that efforts will be made to compact the additional 24 inches of "clayey soils" and EPA can find no justification to the assumption of 10(-8) cm/sec permeability for the upper 1.5-2.0 ft of clay layer, even if that goal can be reached for the underlying "cap" part of the layer. Please clarify these assumptions or redo the simulations.

Response: *Construction of the landfill cap improvements will require a minimum 24-inch thick, undisturbed clay layer. This 24-inch thick layer will be made up of, primarily, existing clay material. Geotechnical testing indicates that the existing material has an average vertical permeability of 2.4x10-7 cm/s. Additional clay material will then be added to this minimum thickness. This material will be placed and compacted such that an average vertical permeability of 1x10-7 cm/s is achieved. As noted above, an appropriate compaction specification for the additional clay material (import) will be included in the Project Technical Specifications such that a 1x10-7 cm/s permeability will be achieved. This construction will be adequate to prevent additional infiltration through the 24-inch thick, undisturbed clay layer. The IAWP has been revised to reflect this change in approach.*

Ohio EPA Comment #1, Section 1.3.1, Pages 2 and 3: The second paragraph of this section states: "...a recreation residual risk standard would be achievable for future use using the material already on-site as part of the existing landfill cap system." Please provide documentation with this interim action work plan, to support that statement.

Response: *The IAWP has been revised to include documentation that residual risk in OU16 currently is acceptable for both recreational user and construction worker populations. The following text has been included: Following the approved screening process, only one chemical of concern (manganese) is identified in the clay cap soils. The maximum concentration of manganese is 560 mg/kg.*

The screening criterion for manganese (i.e., 180 mg/kg) is adjusted by a factor of 10 to account for potential noncarcinogenic cumulative effects. However, since there is only one chemical of concern cumulative effects are not applicable. Consequently, the maximum concentration is well below the USEPA Region IX Residential PRG (i.e., 1800 mg/kg) and risks in OU16 currently are acceptable for future receptor populations, including consideration of Grand River risks to the recreator. Detailed documentation of acceptable residual risk for these receptor populations following landfill cap improvements will be provided after completion of the IA in a Construction Certification Report.

Ohio EPA Comment #2, Section 2.1, Page 4, and Appendix G: The geotechnical tests indicate that the soil conductivity goal of 1E-07 cm/sec can be achieved with the soils present on the site. The final design package will need a specification (i.e., percent of maximum density and moisture content) needed to achieve this conductivity and a schedule of testing to assure that this standard is being met.

Response: *The design package will contain a specification and Quality Assurance requirements to verify that the standard is met.*

Ohio EPA Comment #3, Section 2.2, Page 4: The plan calls for direct discharge to surface water of water collected by the drainage system. Will some sort of detention pond be needed?

Response: *Due to the numerous collection points to be installed and the relatively flat grade at this site, no storm water detention will be required for the landfill cap discharge.*

Ohio EPA Comment #4, Section 2.2, Page 4: What is the radius of the starburst pipe network around the catch basins?

Response: *The radius of the starburst drainage pipe ranges between 20 feet and 40 feet depending upon location and required drainage area. This information has been added to the revised IAWP.*

Ohio EPA Comment #5, Section 3.2, Page 5: The third sentence in the first paragraph of this section states: "No excavation will be permitted to extend below the existing cap vertical limits..." Does this mean that excavation will not extend below the 24"- minimum clay cap or that excavation will not extend through the fly ash layer into the chromate waste? Please clarify this section, as appropriate.

Response: *A minimum of 24 inches of clay will be left undisturbed over the entirety of the cap. No excavation will extend into this 24-inch thick, undisturbed clay layer. The IAWP has been revised to clarify this constraint.*

Ohio EPA Comment #6, Figure 2: Will the sand drainage layer, above the clay layer, be adequate to support the turf grass cover or will some additional topsoil be necessary?

Response: *No topsoil will be required to support the turf grass. The sand selected for the drainage layer will be specified such that it will meet the United States Golf Association requirements for fairway construction.*

Respectfully Submitted,

Paul J. Dugas
Tierra Solutions, Inc.

Hull & associates, inc.
6161 Cochran Road, Suite D • Solon, Ohio 44139 • (440) 519-2555

LETTER OF TRANSMITTAL

DATE: 8/21/06	HAI Job No.: TIE016
SUBJECT: Interim Action Work Plan OU16 Site Improvements	

TO: Mr. Brad Bradley
US EPA
Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

We are sending you

☒ Reports ☐ Plans ☐ Specifications ☐ Invoice
☐ Prints ☐ Change Order ☐ Copy of letter ☐

Item	Date	Copies	Description
1	8/2006	1	Interim Action Work Plan OU16 Site Improvements for Former Diamond Shamrock Painesville Works Site; Hull document # TIE016.600.0014

These are transmitted as checked below:

☐ For signature ☐ For review and comment ☐ For approval ☐ As requested ☒ For your use

REMARKS: Please call with any questions or comments.

COPY TO: W/ENCLOSURE

Teri Heer, OEPA NEDO	X (3)
Heidi Sorin, OEPA Central Office	X
Paul Dugas, Tierra Solutions, Inc.	X
Teresa Jordan, TERSCO Environmental	X
Johanna Coulter, Andrews and Kurth	X
Dave Rabbe, Tierra Solutions, Inc.	X
Bill Hutton, William C. Hutton Consultants	X
Jenifer Kwasniewski, JK Environmental	X
Todd S. David, Esq., Hemisphere Dev.	X

SIGNED: Wm R. Beach

William R. Beach, CPG

If enclosures are not as noted, kindly notify Hull & Associates, Inc. at once.

OhioEPA
State of Ohio Environmental Protection Agency

Northeast District Office

2110 East Aurora Road
Twinsburg, OH 44087-1924

TELE: (330) 963-1200 FAX: (330) 487-0769
www.epa.state.oh.us

Bob Taft, Governor
Bruce Johnson, Lieutenant Governor
Joseph P. Koncelik, Director

July 12, 2006

CERTIFIED MAIL

Mr. Paul J. Dugas
Painesville PRP Group
P.O. Box 188
Painesville, Ohio 44077-0188

Re: Interim Action Work Plan for OU16 Site Improvements – Diamond Shamrock Painesville Works Site – Lake County, Ohio – Ohio EPA ID # 243-0230

Dear Mr. Dugas:

Ohio EPA has recently completed its review of the Interim Action Work Plan for site improvements on OU16. Based on this review, Ohio EPA is disapproving this document. Please respond to the Agency's comments, provided below:

Comment # 1, Section 1.3.1, Pages 2 and 3

The second paragraph of this section states: "...a recreation residual risk standard would be achievable for future use using the material already on-site as part of the existing landfill cap system." Please provide documentation with this interim action work plan, to support that statement.

Comment # 2, Section 2.1, Page 4, and Appendix C

The geotechnical tests indicate that the soil conductivity goal of 1E-07 cm/sec can be achieved with the soils present on the site. The final design package will need a specification (i.e., percent of maximum density and moisture content) needed to achieve this conductivity and a schedule of testing to assure that this standard is being met.

Comment # 3, Section 2.2, Page 4

The plan calls for direct discharge to surface water of water collected by the drainage system. Will some sort of detention pond be needed?

Comment # 4, Section 2.2, Page 4

What is the radius of the starburst pipe network around the catch basins?

Comment # 5, Section 3.2, Page 5

The third sentence in the first paragraph of this section states: "No excavation will be permitted to extend below the existing cap vertical limits..." Does this mean that excavation will not extend below the 24"- minimum clay cap or that excavation will not extend through the flyash layer into the chromate waste? Please clarify this section, as appropriate.

Comment # 6, Figure 2

Will the sand drainage layer, above the clay layer, be adequate to support the turf grass cover or will some additional topsoil be necessary?

In addition, Ohio EPA recently received a copy of the enclosed comment letter from U.S. EPA, dated July 10, 2006, regarding this work plan. The Agency is requiring that the Painesville PRP Group respond satisfactorily to all of U.S. EPA's comments, as well as Ohio EPA's comments provided above, before approval of the interim action is granted. Please revise the work plan to address all comments and provide a revised version to U.S EPA and Ohio EPA for review within 30-days of receipt of this letter.

If you have any questions, please feel free to contact me at (330) 963-1168.

Sincerely,

Teri R. Heer
Site Coordinator
Division of Emergency and Remedial Response

TRH/kss

enclosure

cc: Sara Galley, Maxus Energy (w/ enclosure)
Bill Beach, Hull & Associates (w/ enclosure)
Teresa Jordan, TERSCO (w/ enclosure)
Brad Bradley, U.S. EPA, Region V

ec: Steve Love, Ohio EPA, DERR, NEDO
Timothy Christman, Ohio EPA, DERR, CO
Larry Antonelli, Ohio EPA, DERR, NEDO

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

July 10, 2006

Paul Dugas
Tierra Solutions
P.O. Box 1487
Painesville, OH 44077

Dear Mr. Dugas:

Thank you for the opportunity to review the June 2006 "Interim Action Work Plan OU 16 Site Improvements" (Work Plan) for the Diamond Shamrock Site in Painesville, Ohio (the Site). The U.S. Environmental Protection Agency (EPA) has the following comments regarding the Work Plan:

1. Section 3–EPA does not fully understand exactly what the regrading is going to entail. Parts of the text indicate that only about 4 inches of the cover will be removed then additional clay and sand material will be added from that point to reach the final grade, which seems protective. However, other parts of the text leave open the possibility that several feet of cap material may be removed from substantial areas leaving large (in comparison to current conditions) parts of the cap with only 24 inches of clay cap (as distinct from the "clayey material" that will placed on top of the cap to form the "clay layer"). For example, in section 3.2 there is the statement that "No excavation will be permitted to extend below the existing cap vertical limits...", which means that you could excavate essentially all of the cap save and inch or so. The possibility that substantial amounts of clay will be removed from much of the cap for regrading, while not necessarily fatal to ultimately reducing infiltration, is a step in the wrong direction. Please clarify the anticipated amount and extent of excavation required for the regrading.

2. Section 3.2–please clarify bullet 5. Does this mean trenches will not penetrate the currently existing landfill cap? Or does this mean they will not penetrate the 24 inches of clayey soils to be placed on top of the landfill cap? Trenches installed into low permeability material that are being used as conduits for water movement risk localized infiltration if the pipes leak.

3. Figure 3–what are the black blotches? Ponds? Trees? Sand traps? If they are ponds or sand traps they have the ability to alter the recharge to the cap. Please identify these features.

4. Appendix A–Comparing the boring numbers in table 1 with the locations on the boring map does not necessarily provide a straightforward comparison. The table and/or figure should be

altered so that there is an unambiguous relation between the locations in the table and the figure. EPA assumes boring number 6003 on the table is boring 6-3 on the map (and so on)? If so, which boring is represented by (say) boring 6005 on the table? boring 6005 on the map? Or boring 6-5? Where is the data for borings 6001 and 6002? If EPA's assumption about the relation between the boring numbers in the table and the map is correct, most of this site appears to have a cap thickness of at least 3 ft, presumably including soil/grass.

Comparing boring locations on table A-1 with locations for geotechncial samples shown on figure 1 also does not agree. Show where the samples were taken from on a figure, and be consistent between text, tables, and figures.

5. Appendix C–EPA does not have the modeling hardware to verify these results, but a couple of issues present themselves.

EPA can see the rationale for selection of the permeability values and perhaps the thickness values for the "existing system", but is unclear as to why it was assumed that the breakdown is 65 and 25 acres, and why were the specific permeability and thickness values assigned as they were? Is it because three of the four (not including the duplicate) permeability tests (75 % or 67 acres) were in the 10(-7) cm/sec range and one was in the 10(-8) cm/sec range? EPA knows of nothing in Appendix A that indicates permeability values varied with cap thickness (of course, EPA can't find the location of the sampling points either, so maybe there is a relation), so why assume lower permeability is associated with thinner parts of the cap? Perhaps it would be more straightforward to assume a permeability of 4.5 x 10(-7) cm/sec and a thickness of 4 ft for the entire landfill as an average?

In terms of the "proposed system" simulation, EPA can find no rationale to assume permeabilities for the clay layer in the 10(-8) cm/sec range. Nothing in the text indicates there are plans to redesign the existing cap to a 10(-8) cm/sec permeability and nothing indicates that such a goal is uniformly achievable. These estimates appear to be essentially made up to allow for calculation of a low value of infiltration. EPA also does understand how 10(-8) cm/sec permeability values are applicable over a thickness of 3.5 ft. The work plan seems to indicate that the cap itself is to be at least (maybe uniformly) 2 ft thick, with an additional 2 ft of "clayey soils" on top of the cap, so EPA can see the rationale for assuming a total thickness of 3.5 ft. However, there is no indication that efforts will be made to compact the additional 24 inches of "clayey soils" and EPA can find no justification to the assumption of 10(-8) cm/sec permeability for the upper 1.5-2.0 ft of clay layer, even if that goal can be reached for the underlying "cap" part of the layer. Please clarify these assumptions or redo the simulations.

If you have any questions concerning these comments, please contact me at (312) 886-4742.

Sincerely,

Brad Bradley
Remedial Project Manager

cc: Teri Heer, Ohio EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

July 10, 2006

Paul Dugas
Tierra Solutions
P.O. Box 1487
Painesville, OH 44077

Dear Mr. Dugas:

Thank you for the opportunity to review the June 2006 "Interim Action Work Plan OU 16 Site Improvements" (Work Plan) for the Diamond Shamrock Site in Painesville, Ohio (the Site). The U.S. Environmental Protection Agency (EPA) has the following comments regarding the Work Plan:

1. Section 3–EPA does not fully understand exactly what the regrading is going to entail. Parts of the text indicate that only about 4 inches of the cover will be removed then additional clay and sand material will be added from that point to reach the final grade, which seems protective. However, other parts of the text leave open the possibility that several feet of cap material may be removed from substantial areas leaving large (in comparison to current conditions) parts of the cap with only 24 inches of clay cap (as distinct from the "clayey material" that will placed on top of the cap to form the "clay layer"). For example, in section 3.2 there is the statement that "No excavation will be permitted to extend below the existing cap vertical limits...", which means that you could excavate essentially all of the cap save and inch or so. The possibility that substantial amounts of clay will be removed from much of the cap for regrading, while not necessarily fatal to ultimately reducing infiltration, is a step in the wrong direction. Please clarify the anticipated amount and extent of excavation required for the regrading.

2. Section 3.2–please clarify bullet 5. Does this mean trenches will not penetrate the currently existing landfill cap? Or does this mean they will not penetrate the 24 inches of clayey soils to be placed on top of the landfill cap? Trenches installed into low permeability material that are being used as conduits for water movement risk localized infiltration if the pipes leak.

3. Figure 3–what are the black blotches? Ponds? Trees? Sand traps? If they are ponds or sand traps they have the ability to alter the recharge to the cap. Please identify these features.

4. Appendix A–Comparing the boring numbers in table 1 with the locations on the boring map does not necessarily provide a straightforward comparison. The table and/or figure should be

altered so that there is an unambiguous relation between the locations in the table and the figure. EPA assumes boring number 6003 on the table is boring 6-3 on the map (and so on)? If so, which boring is represented by (say) boring 6005 on the table? boring 6005 on the map? Or boring 6-5? Where is the data for borings 6001 and 6002? If EPA's assumption about the relation between the boring numbers in the table and the map is correct, most of this site appears to have a cap thickness of at least 3 ft, presumably including soil/grass.

Comparing boring locations on table A-1 with locations for geotechncial samples shown on figure 1 also does not agree. Show where the samples were taken from on a figure, and be consistent between text, tables, and figures.

5. Appendix C–EPA does not have the modeling hardware to verify these results, but a couple of issues present themselves.

EPA can see the rationale for selection of the permeability values and perhaps the thickness values for the "existing system", but is unclear as to why it was assumed that the breakdown is 65 and 25 acres, and why were the specific permeability and thickness values assigned as they were? Is it because three of the four (not including the duplicate) permeability tests (75 % or 67 acres) were in the 10(-7) cm/sec range and one was in the 10(-8) cm/sec range? EPA knows of nothing in Appendix A that indicates permeability values varied with cap thickness (of course, EPA can't find the location of the sampling points either, so maybe there is a relation), so why assume lower permeability is associated with thinner parts of the cap? Perhaps it would be more straightforward to assume a permeability of 4.5 x 10(-7) cm/sec and a thickness of 4 ft for the entire landfill as an average?

In terms of the "proposed system" simulation, EPA can find no rationale to assume permeabilities for the clay layer in the 10(-8) cm/sec range. Nothing in the text indicates there are plans to redesign the existing cap to a 10(-8) cm/sec permeability and nothing indicates that such a goal is uniformly achievable. These estimates appear to be essentially made up to allow for calculation of a low value of infiltration. EPA also does understand how 10(-8) cm/sec permeability values are applicable over a thickness of 3.5 ft. The work plan seems to indicate that the cap itself is to be at least (maybe uniformly) 2 ft thick, with an additional 2 ft of "clayey soils" on top of the cap, so EPA can see the rationale for assuming a total thickness of 3.5 ft. However, there is no indication that efforts will be made to compact the additional 24 inches of "clayey soils" and EPA can find no justification to the assumption of 10(-8) cm/sec permeability for the upper 1.5-2.0 ft of clay layer, even if that goal can be reached for the underlying "cap" part of the layer. Please clarify these assumptions or redo the simulations.

If you have any questions concerning these comments, please contact me at (312) 886-4742.

Sincerely,

Brad Bradley

Brad Bradley
Remedial Project Manager

cc: Teri Heer, Ohio EPA

Hull & associates, inc.

6161 Cochran Road, Suite D • Solon, Ohio 44139 • (440) 519-2555

LETTER OF TRANSMITTAL

DATE: 6/19/2006	Hull Job No.: TIE016
SUBJECT: OU16	

TO: Ms. Teri Heer
Ohio EPA-NEDO
2110 East Aurora Road
Twinsburg, Ohio 44087

We are sending you

☒Reports ☐Plans ☐Specifications ☐Invoice
☐Prints ☐Change Order ☐Copy of letter ☐

Item	Date	Copies	Description
1	6/2006	3	Interim Action Work Plan OU16 Site Improvements; Hull document #TIE016.600.0014

These are transmitted as checked below:

☐For signature ☐For review and comment ☐For approval ☐As requested ☒For your use

REMARKS:

COPY TO: W/ENCLOSURE

Heidi Sorin, Ohio EPA	✓
Paul Dugas, Tierra Solutions, Inc.	✓
Teresa Jordan, TERSCO Environmental Consulting	✓
Johanna Coulter, Andrews and Kurth	✓
Dave Rabbe, Tierra Solutions, Inc.	✓
Bill Hutton, Tierra Solutions, Inc.	✓
Jenifer Kwasniewski, JK Environmental Solutions	✓
Todd Davis, Hemisphere Development	✓
Byron Best	✓
Brad Bradley, US EPA	✓

SIGNED: Wm R. Beach

William R. Beach, CPG

If enclosures are not as noted, kindly notify Hull & Associates, Inc. at once.

INTERIM ACTION WORK PLAN
OU16 SITE IMPROVEMENTS

For:
FORMER DIAMOND SHAMROCK
PAINESVILLE WORKS SITE

Located at:
PAINESVILLE, OHIO

Prepared for:
PAINESVILLE PRP GROUP
1897 FAIRPORT NURSERY ROAD
PAINESVILLE, OHIO

AUGUST 2006 (REVISED)

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

The Ohio Environmental Protection Agency issued Director's Final Findings and Orders (DFFO) for a Remedial Investigation/Feasibility Study (RI/FS) at the former Diamond Shamrock Painesville Works Site (Site) on September 27, 1995. The Site was subdivided into seven distinct study areas based on historical activities conducted in each area during plant operations. As a part of the FS process, the Site was divided further into twenty-two Operable Units (OUs). The Interim Action Work Plan (IAWP) describes the proposed improvements to OU16 (also known as the chrome landfill).

1.1 General Site Description

The Diamond Shamrock Painesville Works site is an approximately 1,100-acre former chemical manufacturing facility located in Lake County, Ohio (Figure 1). The Diamond Shamrock Painesville Works facility operated from 1912 through 1977 and manufactured a variety of products including, but not limited to, soda ash, baking soda, chromium compounds, carbon tetrachloride, hydrochloric and sulfuric acids, chlorinated wax, and coke.

OU16 is located in the south central portion of the Site and is the site of a former Solvay settling basin and chromite ore processes residue (COPR) disposal site. Following cessation of manufacturing operations, OU16 was permitted as a fly ash landfill and received as much as 740,000 cubic yards of fly ash. Following disposal of fly ash at the site, a clay cap was constructed over the landfill to prevent contact with both the fly ash and COPR. Currently, the landfill is covered with grass and regularly mowed.

1.2 Site-Wide Redevelopment

The entire former Diamond Shamrock Painesville Works Site is being redeveloped by Hemisphere Corporation (Redeveloper) into a destination, resort community that will include public and private access spaces for sports-oriented vacationers and permanent residents. OU16 will be an active part of this redevelopment, with several golf holes and golf practice areas located on top of the cap. The improvements proposed for the OU16 site will contribute to the overall aesthetic improvement of the development, as well as improve the performance of the landfill cap.

1.3 Summary of Existing Cap System

Closure activities were implemented under an Administrative Consent Order (ACO) between U.S. EPA and Diamond Shamrock Chemical Corp. dated 1983, which included the placement of fly ash on the site followed by a clay cap. There are no design or "as-built" drawings of the existing cap system. Information regarding the design and construction of the landfill was obtained from a geotechnical investigation performed in January 2006 (Hull, 2006). The investigation consisted of installing 42 soil borings drilled into the clay cap until the underlying fly ash was encountered. The results of the investigation determined that the thickness of the clay cap ranged from 1.4 to 10.5 feet below existing ground surface with an average thickness of 4.2 feet. In general, a thicker clay cap was present in the southern portion of OU16 near the slope along the Grand River. A report of this geotechnical investigation is included in Appendix A. A schematic of the existing cap cross-section is presented on Figure 2.

The predominant soil type of the cap is described as grey lean clay with sand and grey sandy lean clay with a Unified Soils Classification System (USCS) designation of CL. This clay meets Ohio EPA requirements for clay landfill cap material. Permeability tests were also conducted on the clay cap material. Five in-situ samples of clay cap material were collected using thin-walled Shelby-tubes. These samples were tested using ASTM D1557 for vertical permeability. Results of the analysis indicated that the material meets the Ohio EPA recommended maximum permeability of 1.0×10^{-7} cm/sec to be considered as an acceptable low-permeability cap. The existing cap also effectively prevents surface receptor populations from exposure to fly ash and chromium residuals.

1.3.1 Environmental Assessment of Landfill Cap Material

A total of eight environmental soil samples were collected from the clay cap as part of the geotechnical investigation conducted during January 2006. These samples were submitted for laboratory analysis of target analyte list (TAL) metals including cyanide and hexavalent chromium, Target Compound List (TCL) VOCs, TCL SVOCs, TCL pesticides, TCL polychlorinated biphenyls (PCBs), oxidation-reduction potential (ORP) and total organic carbon (TOC). Analytical results from the investigation are included in Appendix B.

Following the approved screening process, only one chemical of concern (COC) (manganese) is identified in the clay cap soils. Tables 1 through 4 summarize the approved COC screening process. The maximum concentration of manganese is 560 mg/kg. The screening criterion for

manganese (i.e., 180 mg/kg) is adjusted by a factor of 10 to account for potential noncarcinogenic cumulative effects. However, since there is only one chemical of concern cumulative effects are not applicable. Consequently, the maximum concentration is well below the USEPA Region IX Residential PRG (i.e., 1800 mg/kg) and risks in OU16 currently are acceptable for future receptor populations, including consideration of Grand River risks to the recreator. Detailed documentation of acceptable residual risk for recreational user and construction worker populations following landfill cap improvements will be provided after completion of the IA in a Construction Completion Report.

1.4 Objective of Interim Action

The purpose of this IAWP is to re-grade the surface of OU16 and construct a new golf course while enhancing the existing cap system to further reduce infiltration to the landfill.

2.0 CAP SYSTEM IMPROVEMENTS

The planned improvement for OU16 consists of constructing golf course holes over the landfill. A proposed layout for the golf course is shown on Figure 3. Such improvements will turn the landfill into usable land as part of the overall development plan for the Site. No work will be conducted in any area of OU16 as part of this Interim Action except for the landfill cap area.

The performance of the landfill cap as a barrier to infiltration also will be improved. Specifically, a drainage system will be installed according to the golf course design specifications that will reduce infiltration of storm water runoff into the compacted clay cap.

2.1 Clay Cap Improvement

The landfill is currently capped by various thicknesses of clay, ranging from 1.4 feet to 10.1 feet in thickness. An infiltration analysis was performed using the Hydrologic Evaluation of Landfill Performance (HELP) model to evaluate the effectiveness of the proposed cover system by comparing the infiltration through the cap system before and after redevelopment. The basis for the existing cap configuration model was an average vertical permeability of 2.4×10^{-7} centimeters per second (cm/s) and an average cap thickness of four (4) feet as determined by Hull's geotechnical investigation of the cap.

Using the soil properties determined from the January 2006 geotechnical evaluation and conservative golf course irrigation estimates, it was determined by use of the HELP model that a minimum thickness of existing landfill cap material of 24 inches across the entire landfill cap area (at the current, average permeability of 2.4×10^{-7} cm/s) overlain by a minimum thickness of six inches of compacted clay across the entire landfill cap area (having an average, in-place, vertical permeability of 1.0×10^{-7} cm/s), overlain by a variable thickness varying clay thicknesses of clay having a vertical permeability of 1×10^{-7} cm/s additional clayey soils, and finally covered by 6 to 12 inches of sand (modeled as 8 inches), topped with vegetation, would offer better performance than the existing clay cap alone. A summary of this infiltration analysis is provided in Appendix C. A cross-section of the proposed cap improvements is presented on Figure 2.

2.2 Drainage System

The storm water collection system will consist of numerous catch basins, shown on Figure 3, located within the boundaries of the landfill. The catch basins will be connected to small

be between 20 feet and 40 feet. The water will collect within the piping and then be discharged to surface water.

3.0 CONSTRUCTION OF CAP IMPROVEMENTS

Both physical and aesthetic improvements are planned for the landfill area of OU16. These improvements include grading the existing compacted clay cap to a minimum thickness of 24 inches over the entire landfill and then overlaying the clay cap with additional clayey soils followed by a sand-based drainage layer. The additional clayey soil placed over the landfill cap will provide additional protection of the landfill cap materials, improve the performance of the cap system, and improve the aesthetic quality of the landfill for its end-use as a golf course.

3.1 Summary of System Improvements

Improvements to the OU16 clay cap containment system include:

1. Re-grading and compacting the existing clay cap to no less than 24 inches in thickness;
2. Placement of a minimum of six inches of clay soils having an average, in-place, vertical permeability of $1x10^{-7}$ cm/s over the entire landfill area;
3. Placement of a varying amount of clayey soils over the clay cap;
4. Installation of a drainage system over the entire landfill area;
5. Placement of 6 to 12 inches of sand over the clayey soils over the entire landfill area; and
6. Spreading of seed and other shallow-root vegetation to establish the vegetative cover for the golf course over the entire landfill area.

3.2 Installation of Improvements

Existing vegetation will be scalped from the surface of the landfill to a maximum depth of four inches. This work will provide a working surface to aid in grading of the site and making the surface capable of accepting the additional clay fill. A small amount of regrading of the existing cap system will be performed following the scalping activities. This is estimated to be approximately 8,000 cubic yards, compared to an estimated 472,000 cubic yards of clay to be imported from off-site. Generally, material to be removed from the existing landfill cap horizon will be limited to areas where the existing landfill cap thickness exceeds 5 feet. The minimum planned thickness of clay in these areas following regrading of the clay will be 24 inches. Following completion of grading activities, additional clean clay material will be imported and placed such that and overall 1×10^{-7} cm/s is achieved over the entire OU prior to the installation

of the on-site drainage system. Imported soil fill will be appropriately characterized prior to construction to ensure that risk goals for the intended recreational end-use can be met.

The installation sequence for the improvements is as follows:

1. Implementing a Storm Water Pollution Prevention Plan (SWP3)/Best Management Practices (BMP) measures to be maintained during construction

2. Scalping of grass and other vegetation from the OU;

3. Cutting, grading, and re-compacting approximately 8,000 cubic yards (cy) of the existing clay cap to meet landfill cap performance specifications (this accounts for less than 2% of the total earthwork to be performed during installation of cap improvements);

4. Placement of a minimum of six inches of compacted, clay soil that will achieve an average, in-place, vertical permeability of $1x10^{-7}$ cm/s;

5. Placing a varying amount of imported clayey soils compacted to achieved overall permeability of 1×10^{-7} cm/s over the clay cap as per the contract drawings to meet design grades;

6. Installing stormwater collection system. Trenches will not penetrate the existing, 24-inch minimum clay cap. Pipes will be sloped for proper gravity drainage. Leakage testing will be performed prior to backfilling of the trenches;

7. Placement of 6 to 12 inches of sand over the clayey soils; and

8. Seeding of all disturbed surfaces, removal of temporary SWP3 controls, and performance of final site clean up.

Approximately 472,000 cubic yards of additional fill material will be needed to achieve cap improvements. Items 4 and 5 account for the balance of imported fill brought to OU16.

3.3 Additional Golf Course Construction Activities

Final golf course construction activities will include the shaping of greens and tees and the installation of a golf course irrigation system. All golf course construction components and activities will be completed above the minimum 24-inch thickness of the existing cap. The drainage system discussed in Section 3.2 is being installed to provide additional drainage capacity to the landfill cap. This drainage system is inclusive of the golf course area. Sand traps, tees, fairway low spots, and all other features of the golf course will be drained either directly by means of a catch basin or indirectly though the use of the sand layer and radial, sub-grade drainage system as described in Section 2.2.

4.0 REPORTING REQUIREMENTS

All plans and specifications will be provided to Ohio EPA and U.S. EPA a minimum of 30 days prior to the start of construction activities.

A Construction Certification Report will be provided to Ohio EPA and U.S. EPA following the completion of construction activities described herein. This report will include the following components:

- Pre-and post-construction survey information;
- Identification of any modifications made to the design specifications after the start of construction. Under no circumstances will the final construction of a minimum cap thickness of 24-inches be compromised;
- An updated risk assessment that quantifies risk to future receptor populations with respect to all pertinent exposure pathways; and
- A certification statement from the Engineer of Record.

5.0 REFERENCES

Pertinent portions of a variety of technical documents and publications were referred to during the course of this project. Some of the references consulted are presented below. The guidelines and procedures presented in the documents and publications referenced have been strictly adhered to unless stated otherwise.

Work Plan for Geotechnical Subsurface Exploration – Parcel 6B1, Professional Services Industries, Inc., May 31, 2005.

U.S. Environmental Protection Agency [USEPA]. (1989a). *Risk Assessment Guidance for Superfund, Volume 1. Human Health Evaluation Manual (Part A),* interim final. Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002.

SECOR, Inc. (1997). *Remedial Investigation Feasibility Study Work Plan for the Diamond Shamrock Painesville Works Site.*

FIGURES

CAP INVESTIGATION
FORMER DIAMOND SHAMROCK PAINSVILLE WORKS SITE
OPERABLE UNIT OU16

TABLE 1

CLAY THICKNESS SUMMARY

BORING NO.	CAP THICKNESS[1] (feet)	DATE	LOCATION	SHELBY TUBE INTERVAL[1] (feet)
6003	3.2	1/16/2006	See Boring Location Map	
6004	3.1	1/17/2006	See Boring Location Map	
6005	4.1	1/19/2006	See Boring Location Map	0.5 - 2.5
6006	2.8	1/20/2006	See Boring Location Map	
6007	3.4	1/19/2006	See Boring Location Map	
6008	2.3	1/19/2006	See Boring Location Map	
6009	4.1	1/20/2006	See Boring Location Map	2 - 4
6010	2.4	1/19/2006	See Boring Location Map	
6011	3.6	1/20/2006	See Boring Location Map	0.5 - 2.5
6012	4.8	1/20/2006	See Boring Location Map	
6013	2.8	1/17/2006	See Boring Location Map	
6014	3.1	1/19/2006	See Boring Location Map	
6015	2.8	1/16/2006	See Boring Location Map	
6016	4.4	1/16/2006	See Boring Location Map	
6017	3.6	1/17/2006	See Boring Location Map	1 - 3
6018	3.5	1/17/2006	See Boring Location Map	
6019	10.5	1/17/2006	See Boring Location Map	
6020	3.3	1/19/2006	See Boring Location Map	
6021	5.3	1/17/2006	See Boring Location Map	
6022	6.0	1/17/2006	See Boring Location Map	
6023	2.7	1/17/2006	See Boring Location Map	
6024	3.9	1/19/2006	See Boring Location Map	
6025	3.3	1/16/2006	See Boring Location Map	
6026	2.6	1/16/2006	See Boring Location Map	
6027	3.1	1/16/2006	See Boring Location Map	
6028	6.3	1/19/2006	See Boring Location Map	
6029	7.5	1/17/2006	See Boring Location Map	
6030	3.5	1/17/2006	See Boring Location Map	1 - 3
6031	4.6	1/16/2006	See Boring Location Map	
6032	3.6	1/16/2006	See Boring Location Map	
6033	2.5	1/17/2006	See Boring Location Map	
6038	9.5	1/20/2006	between 6012 & 6019	
6034	2.5	1/31/2006	between 6015 & 6018	
6035	2.5	1/31/2006	between 6027 & 6028	
6036	5.0	1/31/2006	between 6028 & 6030	
6037	2.5	1/31/2006	between 6028 & 6023	
6039	8.0	1/31/2006	between 6023 & 6022	
6040	2.5	1/31/2006	between 6018 & 6019	
6041	8.0	1/31/2006	between 6019 & 6022	
6042	4.8	1/31/2006	between 6013 & 6019	
6043	3.0	1/31/2006	between 6038 & 6011	
6044	7.0	1/31/2006	between 6043 & 6041	

[1] Measurements taken from existing ground surface.

CAP INVE[illegible]ATION
FORMER DIAMOND SHAMROCK PAINESVILLE WORK SITE
OPERABLE UNIT 16

TABLE A-I

SUMMARY OF USCS AND AND PERMEABILITY TEST RESULTS

LAB NUMBER	LOCATION	DEPTH (feet)	NATURAL MOISTURE	DESCRIPTION	USCS	LL	PL	% GRAVEL	% SAND	% SILT	% CLAY (.005mm)	PERMEABILITY (cm/sec)
06-019	6003	2.0-3.1'	13.0	GREY LEAN CLAY WITH SAND	CL	31	17	2.5	17.2	48.9	31.4	---
06-023	6008	0.5-2.0'	15.7	GREY LEAN CLAY WITH SAND	CL	32	19	3.1	20.8	45.1	31.0	---
06-033	6021	2.0-4.0'	12.3	GREY LEAN CLAY WITH SAND	CL	28	17	2.7	20.9	46.7	29.7	---
06-035	6023	0.5-2.0'	13.5	GREY SANDY LEAN CLAY	CL	27	17	4.2	27.7	42.0	26.1	---
06-038	6026	0.6-2.0'	12.2	GREY SANDY LEAN CLAY	CL	25	15	8.5	32.1	38.3	21.1	---
06-046	6011	0.5-2.5'	12.8	GREY LEAN CLAY WITH SAND	CL	30	17	1.7	23.6	44.2	30.5	4.86×10^{-8}
06-047	6009	2.0-4.0'	21.4	BROWN/GREY LEAN CLAY	CL	47	26	0.0	10.4	57.2	32.4	2.04×10^{-7}
06-048	6005	0.5-2.5'	11.1	BROWN/GREY LEAN CLAY WITH SAND	CL	28	17	3.0	23.3	42.3	31.4	2.48×10^{-8}
06-049	6017	1.0-3.0'	13.9	GREY FRAC BROWN LEAN CLAY WITH SAND	CL	28	18	3.2	12.8	49.4	34.6	1.02×10^{-7}
06-050	6030	1.0-3.0'	13.3	GREY FRAC BROWN LEAN CLAY WITH SAND	CL	29	18	3.1	21.4	47.7	27.8	1.03×10^{-7}

NOTES:

1 - Lab Sample Number 06048 was incorrectly logged as boring location 6011. This sample actually corresponds to soil boring location 6005. This has been corrected here; but the original geotechnical laboratory report was not changed.

2 - Shelby Tube samples were collected for soil boring locations 6005, 6009, 6011, 6017, and 6030 only.

INTERIM ACTION WORK PLAN
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
OPERABLE UNIT 16

TABLE 1

SUMMARY OF CHEMICALS DETECTED IN CLAY CAP SURFACE SOIL [1] (MG/KG)

Parameter	Number of Detects	Number of Results	Detection Frequency	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)
Acetone	8	8	100.0%	0.008	0.016
Alpha Chlordane	1	8	12.5%	0.00021	0.00021
Aluminum	8	8	100.0%	10600	11700
Arsenic	8	8	100.0%	10.7	16.2
Barium	8	8	100.0%	52.8	84.8
Benzene	5	8	62.5%	0.001	0.002
Benzo[a]pyrene	1	8	12.5%	0.06	0.06
Beryllium	8	8	100.0%	0.53	0.6
Beta-Bhc	2	8	25.0%	0.00023	0.00027
Calcium	8	8	100.0%	19900	32200
Carbon Disulfide	7	8	87.5%	0.003	0.007
Chromium	8	8	100.0%	16.8	24.1
Chromium(VI)	2	8	25.0%	0.35	0.37
Chrysene	1	8	12.5%	0.049	0.049
Cobalt	8	8	100.0%	12.2	15.5
Copper	8	8	100.0%	25.1	29.1
Gamma-Chlordane	1	8	12.5%	0.0002	0.0002
Heptachlor Epoxide	3	8	37.5%	0.00021	0.00023
Iron	8	8	100.0%	29400	34900
Lead	8	8	100.0%	14.9	17.5
Magnesium	8	8	100.0%	7690	11100
Manganese	8	8	100.0%	362	560
Nickel	8	8	100.0%	31.2	36.5
Phenanthrene	3	8	37.5%	0.044	0.048
Potassium	8	8	100.0%	1830	2240
Silver	8	8	100.0%	0.17	0.48
Sodium	8	8	100.0%	157	247
Thallium	1	8	12.5%	2.9	2.9
Toluene	8	8	100.0%	0.001	0.004
Vanadium	8	8	100.0%	15.2	17
Xylenes	4	8	50.0%	0.001	0.002
Zinc	8	8	100.0%	72.2	86.8

[1]All clay cap soil samples were collected within the upper 5 feet of the surface in order to maintain and preserve the integrity of the clay cap.

TABLE 2

SITE-SPECIFIC BACKGROUND CONCENTRATIONS OF METALS IN SURFACE SOIL AND COMPARISON TO CLAY CAP SURFACE SOIL DATA

Parameter	Background Surface Soil Minimum Detect (mg/kg)	Background Surface Soil Maximum Detect (mg/kg)	Site-Specific Background Surface Concentrations Arithmetic Mean (mg/kg)	Site-Specific Background Surface Concentrations Standard Deviation (mg/kg)	Site-Specific Background Surface Concentrations Arithmetic Mean + 2 Standard Deviations (mg/kg)	Maximum Clay Cap Surface Soil Concentration (mg/kg)	Exceeds Site-Specific Background?
Aluminum	3,600	9890	7,770	2,440	12,600	11,700	NO
Antimony	8.7[a]	8.7[a]	NA	NA	8.7[a]	--[c]	NO
Arsenic	11.8	17.4	13.9	2.44	18.8	16.2	NO
Barium	29.8	126	62.5	38.7	140	84.8	NO
Beryllium	0.38	0.9	0.62	0.21	1.04	0.6	NO
Cadmium	0.22	1.90	0.45	0.82	2.08	--	NO
Chromium	15	46.9	27	12	51	24.1	NO
Hexavalent chromium[b]	NA	NA	NA	NA	NA	0.37	**YES**
Cobalt	2.38	10.4	7.06	3.18	13.4	15.5	**YES**
Copper	10.5	23.5	16.2	4.69	25.6	29.1	**YES**
Lead	11.3	97.4	43.1	38.3	120	17.5	NO
Manganese	121	455	288	120	527	560	**YES**
Mercury	0.02	0.24	0.09	0.10	0.28	--	NO
Nickel	10.3	19.8	15.2	4.02	23.2	36.5	**YES**
Selenium	NA	NA	NA	NA	NA	--	NO
Silver	0.14	0.14	0.08	0.04	0.16	0.48	**YES**
Thallium	1.7	2.8	2.25	0.53	3.30	2.9	NO
Vanadium	8.7	21.1	16.0	4.60	25.2	17	NO
Zinc	45.5	177	85.9	53.1	192	86.8	NO

NA - Arithmetic mean, standard deviation, and background concentration not calculated because chemical was not detected in background soil sample.

a. Background concentration for Antimony obtained from USEPA surface soil background data (1990). Antimony was not detected in any of the site background samples. Therefore, it was not averaged with two standard deviations.

b. Hexavalent chromium was detected in background soils samples but is not used for this comparison.

c. --- Metal not detected at this OU.

INTERIM ACTION WORK PLAN
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
OPERABLE UNIT 16

TABLE 3

SELECTION OF COCs IN CLAY CAP SURFACE SOIL (MG/KG)

Parameter	Maximum Clay Cap Surface Soil Detect (mg/kg)	Region IX PRG (mg/kg)	Exceed Region IX PRG - Residential ?	Region IX PRG Industrial (mg/kg) (2004)	Exceed Region IX PRG - Industrial ?
ACETONE	0.016	1400	NO	5400	NO
ALPHA-CHLORDANE[a]	0.00021	1.6	NO	6.5	NO
BENZENE	0.002	0.64	NO	1.4	NO
BENZO(A)PYRENE	0.06	0.062	NO	0.21	NO
BETA-BHC	0.00027	0.32	NO	1.3	NO
CARBON DISULFIDE	0.007	36	NO	720	NO
CHROMIUM (VI)	0.37	30	NO	64	NO
CHRYSENE	0.049	62	NO	210	NO
COBALT	15.5	900	NO	1,900	NO
COPPER	29.1	310	NO	4,100	NO
GAMMA-CHLORDANE[a]	0.0002	1.6	NO	6.5	NO
HEPTACHLOR EPOXIDE	0.00023	0.053	NO	0	NO
MANGANESE	**560**	**180**	**YES**	1,900	NO
NICKEL	36.5	160	NO	2,000	NO
HENANTHRENE[b]	0.048	2,200	NO	10,000	NO
ILVER	0.48	39	NO	5,100	NO
TOLUENE	0.004	520	NO	520	NO
XYLENE (TOTAL)	0.002	27	NO	420	NO

NOTE: In accordance with OEPA (December 22, 1998), all noncarcinogenic Region IX PRGs were reduced by a factor of 10 to account for possible cumulative effects

a. The PRG for Chlordane was used as a surrogate for Alpha-Chlordane and Gamma-Chlordane.

b. The PRG for Anthracene was used as a surrogate for Phenanthrene.

TABLE 4

IDENTIFICATION OF COCs IN CLAY CAP SURFACE SOIL

32 Chemicals Detected at Least Once (See Table 2-5)	*Tentatively Identified Compounds (0)*	*Essential Nutrient Evaluation (5)*	*Chemicals Detected in Laboratory Blanks (0)*	*Detection Frequency Evaluation (0)*	*Soil Background Evaluation (9)*	*Region IX PRG Evaluation (17)*	1 COC	
							Inorganics	Organics
	Chemicals reported as TICs were not included in the data summary tables; therefore, TICs did not comprise any of the 32 chemicals detected	Calcium Iron Magnesium Potassium Sodium			Aluminum Arsenic Barium Beryllium Chromium Lead Thallium Vanadium Zinc	Acetone Alpha Chlordane Benzene Benzo(a)pyrene Beta-BHC Carbon Disulfide Chromium (VI) Chrysene Cobalt Copper Gamma-Chlordane Heptachlor Epoxide Nickel Phenanthrene Silver Toluene Xylenes	Manganese	

FIGURES

OHIO

QUADRANGLE LOCATION

SCALE 1" = 2000'

SOURCE: USGS 7.5 MIN QUADRANGLE

MENTOR, OHIO 1963
(REVISED 1992)

FIGURE 1

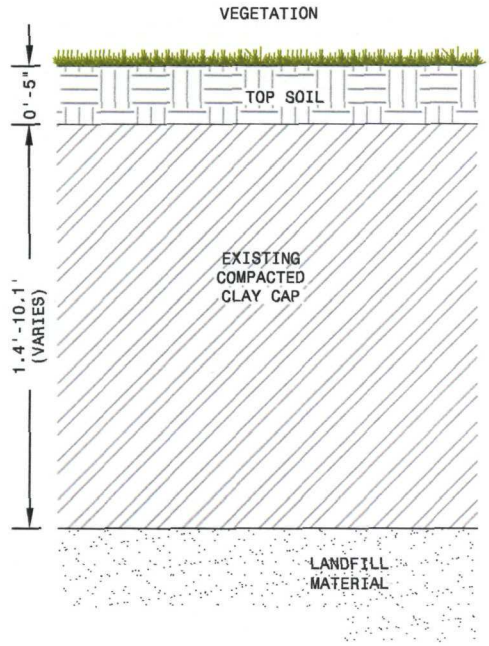
HULL & ASSOCIATES, INC.
SOLON, OHIO

INTERIM ACTION WORK PLAN
OPERABLE UNIT 16

SITE LOCATION MAP

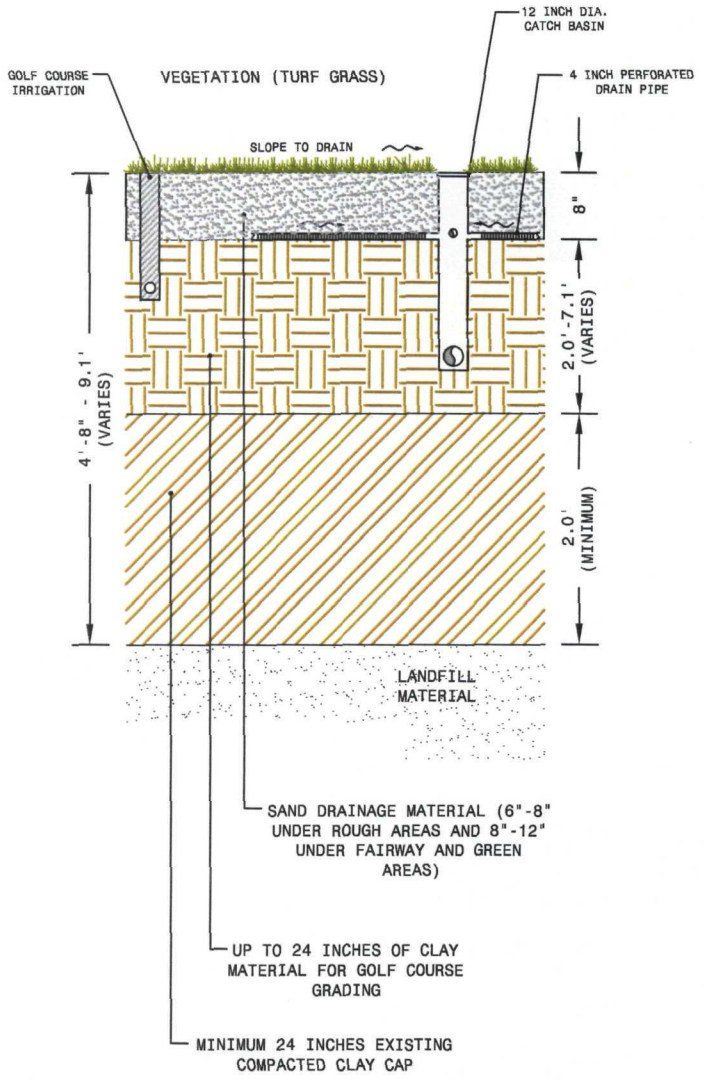
1897 FAIRPORT NURSERY ROAD
CITY OF PAINESVILLE, LAKE COUNTY, OHIO

DATE: AUGUST 2006 TIE016.600.0055.XLS



EXISTING OU16 CAP CONSTRUCTION
GENERALIZED SCHEMATIC

NO SCALE



PROPOSED OU16 CAP CONSTRUCTION
GENERALIZED SCHEMATIC

NO SCALE

Hull & associates, inc.
ENGINEERS | GEOLOGISTS | SCIENTISTS | PLANNERS

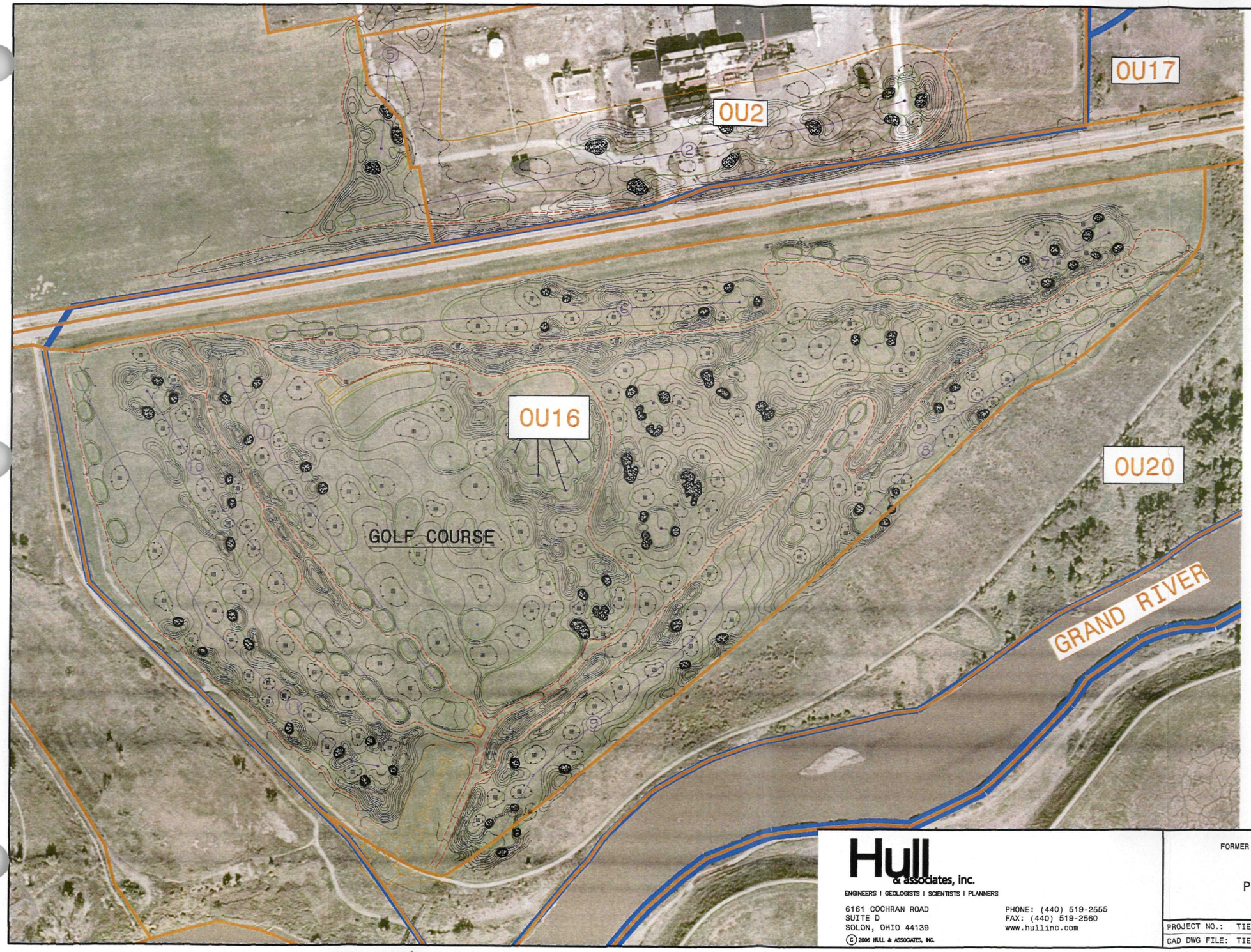
6161 COCHRAN ROAD
SUITE D
SOLON, OHIO 44139

PHONE: (440) 519-2555
FAX: (440) 519-2560
www.hullinc.com

FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
OPERABLE UNIT 16

FIGURE 2
EXISTING AND PROPOSED CAP IMPROVEMENTS

PROJECT NO.: TIE016	SUBMITTAL DATE: OCTOBER 2006
CAD DWG FILE: TIE016.600.0007	PLOT DATE: 10/10/06



N

SCALE IN FEET

LEGEND:

- CATCH BASIN
- SAND TRAP/BUNKER
- OU16 BOUNDARY
- GOLF HOLE CENTERLINE
- GOLF COURSE OUT OF BOUNDS

Hull & associates, inc.
ENGINEERS | GEOLOGISTS | SCIENTISTS | PLANNERS
6161 COCHRAN ROAD
SUITE D
SOLON, OHIO 44139
PHONE: (440) 519-2555
FAX: (440) 519-2560
www.hullinc.com

PAINESVILLE PRP GROUP
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
OU16 INTERIM ACTION WORK PLAN

FIGURE 3
PROPOSED OU16 LAND USE

1897 FAIRPORT NURSERY ROAD
PAINESVILLE, LAKE COUNTY, OH

PROJECT NO.: TIE016	SUBMITTAL DATE: OCTOBER 2006
CAD DWG FILE: TIE016.600.0008	PLOT DATE: 10/10/06

ATTACHMENT 3

Revised Infiltration Analysis

APPENDIX A

Geotechnical Investigation

Painesville PRP Group
P.O. Box 188
Painesville, Ohio 44077-0188
(440) 350-9902

June 13, 2006

Ms. Teri Heer
Site Coordinator
Division of Emergency and Remedial Response
Ohio Environmental Protection Agency
Northeast District Office
2110 East Aurora Road
Twinsburg, Ohio 44087

Re: Geotechnical Laboratory Testing Results from the Cap Investigation Completed in Operable Unit OU16 at the Former Diamond Shamrock Painesville Works Site, Painesville, Lake County, Ohio (Site); TIE016.600.0013

Dear Ms. Heer:

This letter provides the geotechnical laboratory testing results completed as part of the cap investigation performed by Hull & Associates, Inc. (Hull) between January 16 and 21 and January 27 and 30, 2006 at the referenced Site. The purpose of the investigation was to obtain information on the geotechnical characteristics of the upland capped portion of OU16 (e.g., cap thickness, cover soils permeability, etc.) and to better understand the hydrogeologic conditions of the landfill. This information can be used for development considerations since it is understood OU16 may necessitate regrading of the cap and will require recompaction of the soil material.

Thirty-two borings were drilled with an ATV Geo-Probe drill rig and were advanced from 2.33 to 10.5 feet below existing ground surface. Macro-core samples were continuously collected through the soil cap until the underlying fly ash was encountered. In addition to the macro-core samples, relatively undisturbed (Shelby tube) samples were procured for subsequent laboratory permeability testing. Work was completed in accordance with the *Work Plan for Geotechnical Subsurface Exploration – Parcel 6B1* prepared by Professional Services Industries, Inc. dated May 31, 2005 and additional information submitted to the Ohio Environmental Protection Agency (EPA) by Hull on January 13, 2006. All borings were sealed to the surface with a bentonite slurry, as required by Ohio EPA.

The laboratory testing program focused on an evaluation of the soil's physical characteristics (i.e., grain-size distribution, plasticity characteristics, and optimum moisture content), and mechanical properties such as moisture/density relationships and permeability. All phases of the laboratory-testing program performed by Hull were conducted in general accordance with applicable American Society for Testing and Materials (ASTM) specifications and Hull's Standard Operating Procedures (SOP). All of the laboratory tests were performed in Hull's

AASHTO (American Association of State Highway and Transportation Officials) Accredited Geotechnical Laboratory.

USCS Classification

Select samples were identified based on the Unified Soils Classification System (USCS) to determine the soil cap material's particle-size gradation (ASTM D422) and plasticity characteristics (ASTM D4318). The predominant soil type of the cap can be described as grey lean clay with sand and grey sandy lean clay with a USCS designation of CL, which is acceptable as clayey cap material. At the time of procuring the test borings, the natural moisture contents of the landfill cap samples tested (ASTM D2216) ranged from 11.1 to 21.4 percent and were slightly below the plastic limits (15 to 26), which would suggest the material would require little or no moisture alterations during regrading of the cap to allow adequate compaction.

In addition to the USCS classifications, six (6) permeability tests (ASTM D5084) were performed on relatively undisturbed Shelby tube samples to determine the in-situ permeability of the cap material. The permeability ranged from 2.48×10^{-8} cm/sec to 2.04×10^{-7} cm/sec. The Ohio EPA recommends a maximum permeability of 1.0×10^{-7} cm/sec to be considered as an acceptable low-permeable cap.

Copies of the USCS classification and in-situ permeability tests are provided in Attachment A. Table A-I of Attachment A provides a summary of the test results.

Remolded Permeability Tests

One Modified Proctor test (ASTM D1557) was performed on a soil sample composited from the Shelby tube samples tested for in-situ permeability as previously discussed. The composite sample is considered representative of the landfill soil cap material. The maximum dry density and optimum moisture content for the composite sample is 125.2 pounds per cubic feet (pcf) at 11.5 percent. Three remolded permeability analyses were also performed on the composite sample using the flexible membrane method (ASTM D5084). These samples were remolded at various maximum dry densities and moisture contents to determine the compaction effort that may be needed to meet the 1.0×10^{-7} cm/sec permeability specification.

1. The sample remolded at 90% of the maximum dry density and +1% of optimum moisture resulted in a permeability of 2.36×10^{-7} cm/sec.

2. The sample remolded at 93% of the maximum dry density and at optimum moisture resulted in a permeability of 3.82×10^{-7} cm/sec.

3. The sample remolded at 95% of the maximum dry density and at optimum moisture resulted in a permeability of 8.61×10^{-8} cm/sec.

Copies of the Modified Proctor and remolded permeability laboratory test results are provided in Attachment B.

The results of these test borings will be included in the final design of the proposed landfill cap improvements. If you have any questions, please don't hesitate to contact the undersigned at 440-519-2555.

Sincerely,

for P.J. Dugas
Site Coordinator
Painesville PRP Group

enclosure

cc: Teresa Jordan, TERSCO Environmental Consulting
Paul Dugas, Tierra Solutions, Inc.
Dave Rabbe, Tierra Solutions, Inc.
Todd Davis, Hemisphere
Jenifer Kwasniewski, JK Environmental Solutions
Brad Bradley, U.S. EPA, Region 5, Chicago, Illinois

CAP INVESTIGATION
FORMER DIAMOND SHAMROCK PAINSVILLE WORKS SITE
OPERABLE UNIT OU16

TABLE 1

CLAY THICKNESS SUMMARY

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6003	3.2	1/16/2006	See Boring Location Map	
6004	3.1	1/17/2006	See Boring Location Map	
6005	4.1	1/19/2006	See Boring Location Map	
6006	2.8	1/20/2006	See Boring Location Map	0.5 - 2.5
6007	3.4	1/19/2006	See Boring Location Map	
6008	2.3	1/19/2006	See Boring Location Map	
6009	4.1	1/20/2006	See Boring Location Map	2 - 4
6010	2.4	1/19/2006	See Boring Location Map	
6011	3.6	1/20/2006	See Boring Location Map	0.5 - 2.5
6012	4.8	1/20/2006	See Boring Location Map	
6013	2.8	1/17/2006	See Boring Location Map	
6014	3.1	1/19/2006	See Boring Location Map	
6015	2.8	1/16/2006	See Boring Location Map	
6016	4.4	1/16/2006	See Boring Location Map	
6017	3.6	1/17/2006	See Boring Location Map	1 - 3
6018	3.5	1/17/2006	See Boring Location Map	
6019	10.5	1/17/2006	See Boring Location Map	
6020	3.3	1/19/2006	See Boring Location Map	
6021	5.3	1/17/2006	See Boring Location Map	
6022	6.0	1/17/2006	See Boring Location Map	
6023	2.7	1/17/2006	See Boring Location Map	
6024	3.9	1/19/2006	See Boring Location Map	
6025	3.3	1/16/2006	See Boring Location Map	
6026	2.6	1/16/2006	See Boring Location Map	
6027	3.1	1/16/2006	See Boring Location Map	
6028	6.3	1/19/2006	See Boring Location Map	
6029	7.5	1/17/2006	See Boring Location Map	
6030	3.5	1/17/2006	See Boring Location Map	1 - 3
6031	4.6	1/16/2006	See Boring Location Map	
6032	3.6	1/16/2006	See Boring Location Map	
6033	2.5	1/17/2006	See Boring Location Map	
6038	9.5	1/20/2006	between 6012 & 6019	
6034	2.5	1/31/2006	between 6015 & 6018	
6035	2.5	1/31/2006	between 6027 & 6028	
6036	5.0	1/31/2006	between 6028 & 6030	
6037	2.5	1/31/2006	between 6028 & 6023	
6039	8.0	1/31/2006	between 6023 & 6022	
6040	2.5	1/31/2006	between 6018 & 6019	
6041	8.0	1/31/2006	between 6019 & 6022	
6042	4.8	1/31/2006	between 6013 & 6019	
6043	3.0	1/31/2006	between 6038 & 6011	
6044	7.0	1/31/2006	between 6043 & 6041	

[1] Measurements taken from existing ground surface.

FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
FAIRPORT-NURSERY ROAD, PAINESVILLE, OH
FEASIBLITY STUDIES/REMEDIAL DESIGN

CLIENT:
TIERRA SOLUTIONS INC.
1897 FAIRPORT-NURSERY ROAD
PAINESVILLE, LAKE COUNTY, OHIO

MARK	DATE	DESCRIPTION

PROJECT NO.: TIE016
CAD DWG. FILE: TIE016.400.0009
PLOT DATE: 8/21/08
LAYOUT BY: VS
DRAWN BY: BB
CHECKED BY:
SCALE: AS NOTED
SUBMITTAL DATE: AUGUST 2008
© 2008 HULL & ASSOCIATES, INC.
SHEET TITLE:

CAP INVESTIGATION
OPERABLE UNIT 16
(GEOTECHNICAL)

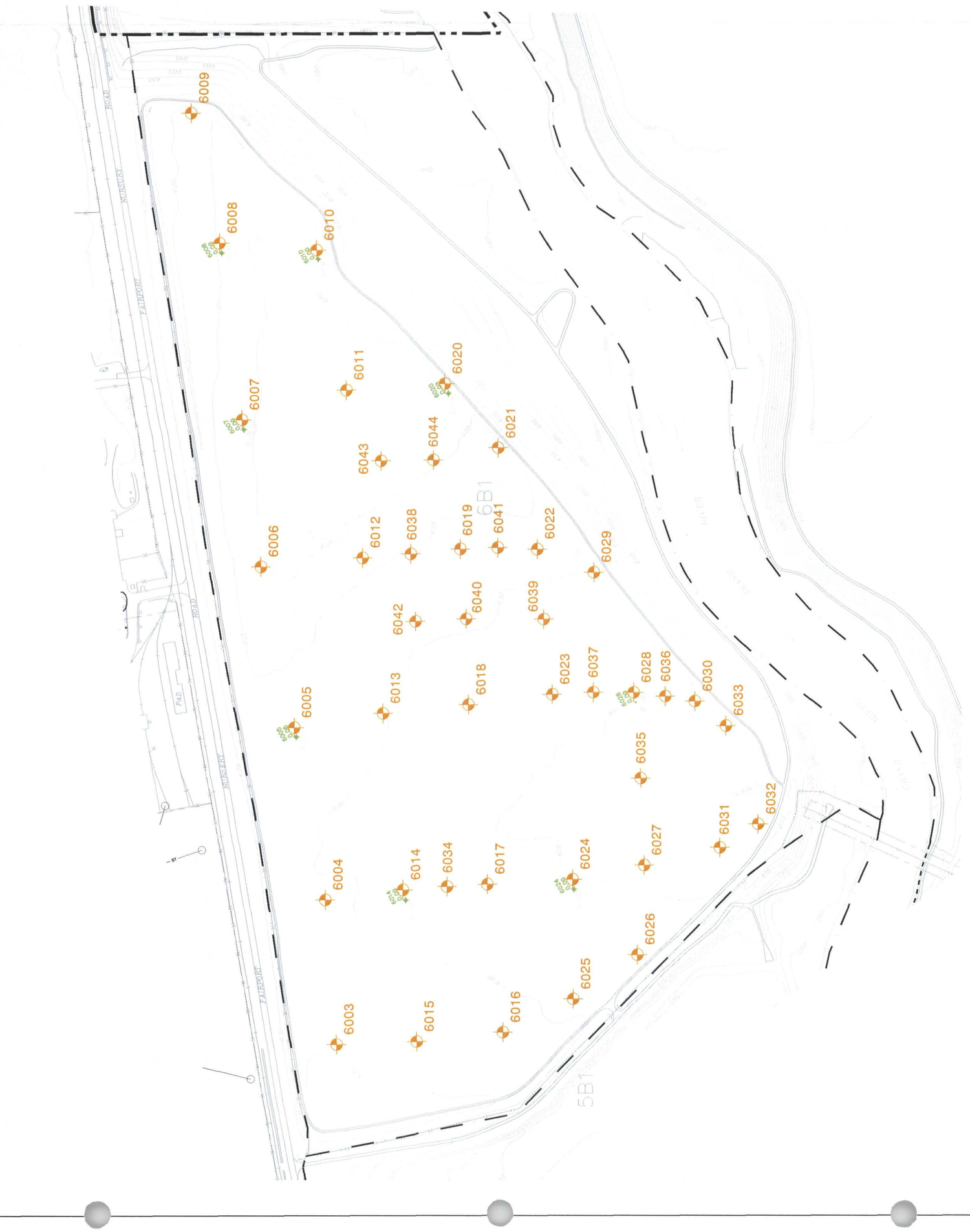
DEPA CODE: TITLE
SHEET OF

REGISTERED ENGINEER
DATE

Hull & associates, inc
ENGINEERS | GEOLOGISTS | SCIENTISTS | PLANNERS
6161 COCHRAN ROAD
SUITE D
SOLON, OHIO 44139
PHONE: (440) 519-2555
FAX: (440) 519-2560
www.hullinc.com

LEGEND
GEOTECHNICAL BORING
GEOTECHNICAL AND ENVIRONMENTAL BORING

N
SCALE IN FEET
0 80 160 240



ATTACHMENT A

USCS Classification and Permeability Test Results

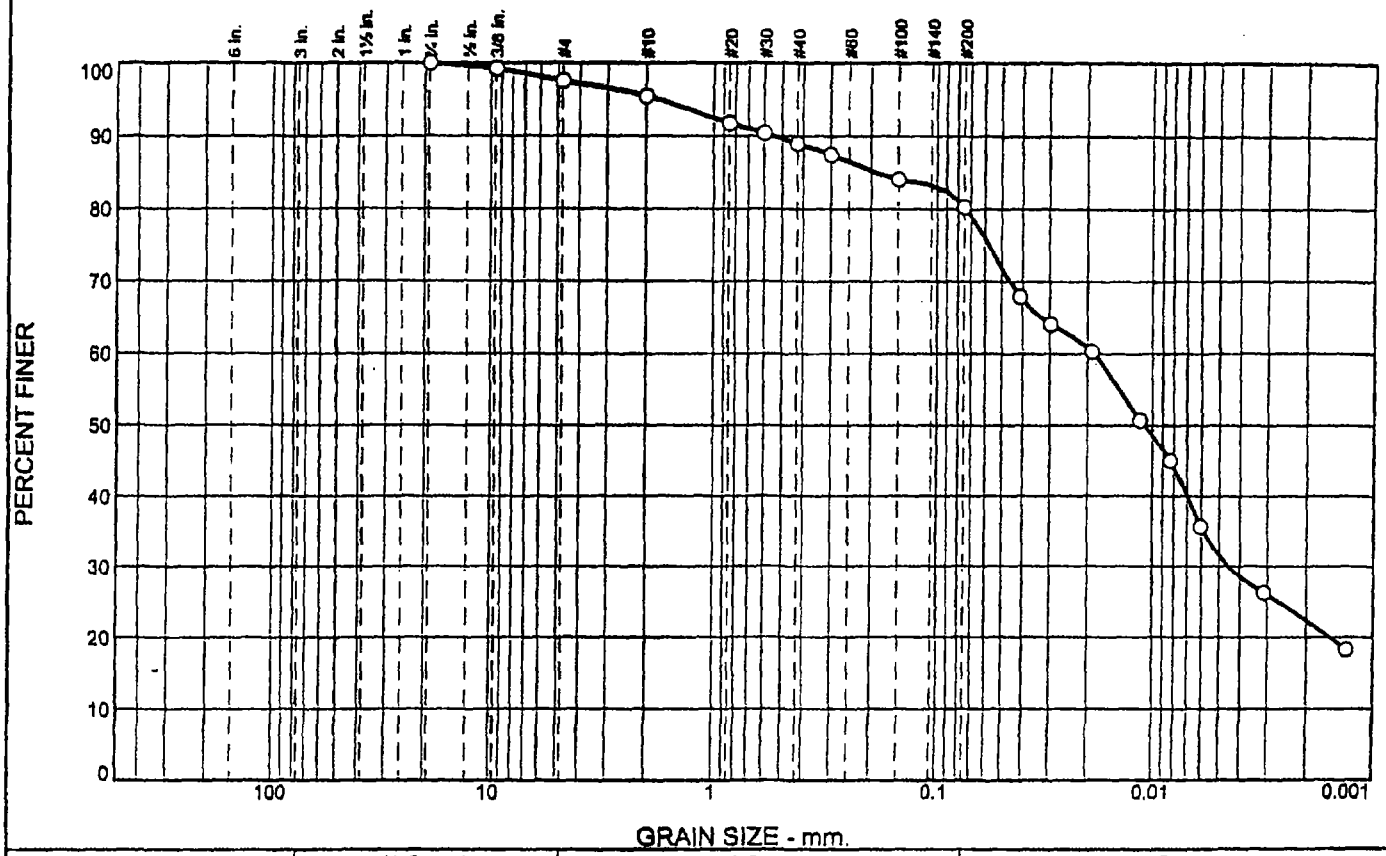
CAP INVESTIGATION
FORMER DIAMOND SHAMROCK PAINESVILLE WORK SITE
OPERABLE UNIT 16

TABLE A-I

SUMMARY OF USCS AND AND PERMEABILITY TEST RESULTS

06-019	6003	2.0-3.1'	13.0	GREY LEAN CLAY WITH SAND	CL	31	17	2.5	17.2	48.9	31.4	—
06-023	6008	0.5-2.0'	15.7	GREY LEAN CLAY WITH SAND	CL	32	19	3.1	20.8	45.1	31.0	—
06-033	6021	2.0-4.0'	12.3	GREY LEAN CLAY WITH SAND	CL	28	17	2.7	20.9	46.7	29.7	—
06-035	6023	0.5-2.0'	13.5	GREY SANDY LEAN CLAY	CL	27	17	4.2	27.7	42.0	26.1	—
06-038	6026	0.6-2.0'	12.2	GREY SANDY LEAN CLAY	CL	25	15	8.5	32.1	38.3	21.1	—
06-046	6011	0.5-2.5'	12.8	GREY LEAN CLAY WITH SAND	CL	30	17	1.7	23.6	44.2	30.5	4.86×10^{-8}
06-047	6009	2.0-4.0'	21.4	BROWN/GREY LEAN CLAY	CL	47	26	0.0	10.4	57.2	32.4	2.04×10^{-7}
06-048	6011	0.5-2.5'	11.1	BROWN/GREY LEAN CLAY WITH SAND	CL	28	17	3.0	23.3	42.3	31.4	2.48×10^{-8}
06-049	6017	1.0-3.0'	13.9	GREY FRAC BROWN LEAN CLAY WITH SAND	CL	28	18	3.2	12.8	49.4	34.6	1.02×10^{-7}
06-050	6030	1.0-3.0'	13.3	GREY FRAC BROWN LEAN CLAY WITH SAND	CL	29	18	3.1	21.4	47.7	27.8	1.03×10^{-7}

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.5	2.0	6.5	8.7	48.9	31.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	99.2		
#4	97.5		
#10	95.5		
#20	91.8		
#30	90.4		
#40	89.0		
#50	87.5		
#100	84.1		
#200	80.3		

* (no specification provided)

Material Description

06-019 6003 DEPTH: 2.0-3.1'
GREY LEAN CLAY WITH SAND

Atterberg Limits (ASTM D 4318)

PL= 17 LL= 31 PI= 14

Classification

USCS= CL AASHTO= A-6(10)

Coefficients

D_{85}= 0.1901 D_{60}= 0.0187 D_{50}= 0.0110
D_{30}= 0.0046 D_{15}= D_{10}=
C_u= C_c=

Date Tested: 2/17/06 **Tested By:** MG/CG

Remarks

NATURAL MOISTURE: 13.0%

Sample No.: 06-019 **Source of Sample:** **Date Sampled:** 1-20-06
Location: 6003 **Elev./Depth:** 2.0-3.1'
Checked By: MIKE GERDEMAN **Title:** SENIOR TECHNICIAN

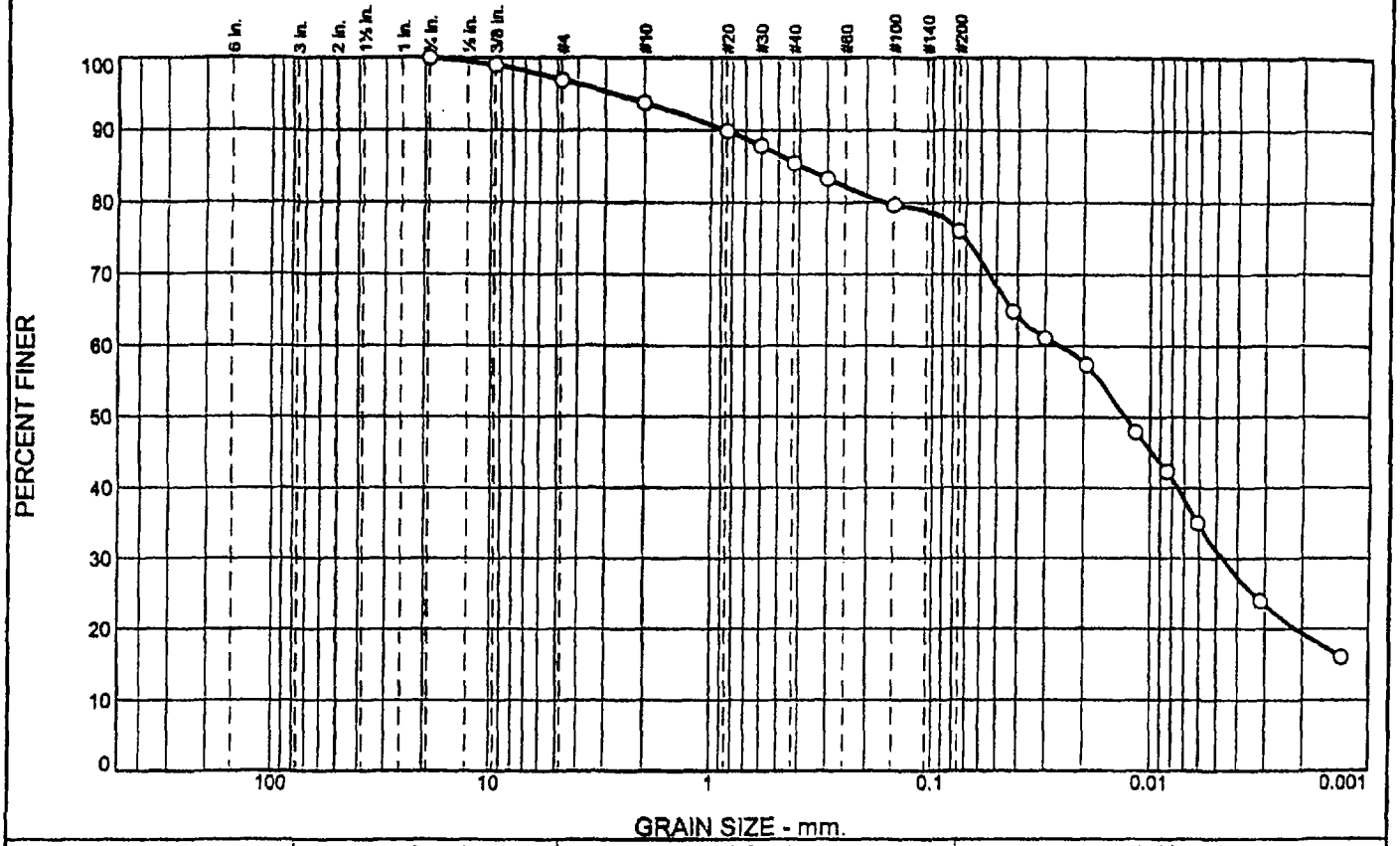
HULL & ASSOCIATES, INC.

Erie, MI

Client: TIERRA SOLUTIONS, INC.
Project: PAINESVILLE (CR CAP)

Project No: TIE-016 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.1	3.1	8.4	9.3	45.1	31.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	99.0		
#4	96.9		
#10	93.8		
#20	89.9		
#30	87.8		
#40	85.4		
#50	83.3		
#100	79.6		
#200	76.1		

* (no specification provided)

Material Description

06-023 6008 DEPTH: 0.5-2.0'
GREY LEAN CLAY WITH SAND

Atterberg Limits (ASTM D 4318)

PL= 19 LL= 32 PI= 13

Classification

USCS= CL AASHTO= A-6(8)

Coefficients

D_{85}= 0.3966 D_{60}= 0.0259 D_{50}= 0.0130
D_{30}= 0.0047 D_{15}= D_{10}=
C_u= C_c=

Date Tested: 2/10/06 **Tested By:** JL/MG/CG

Remarks

NATURAL MOISTURE: 15.7%

Sample No.: 06-023 **Source of Sample:** **Date Sampled:** 1-16-06
Location: 6008 **Elev./Depth:** 0.5-2.0'
Checked By: MIKE GERDEMAN **Title:** SENIOR TECHNICIAN

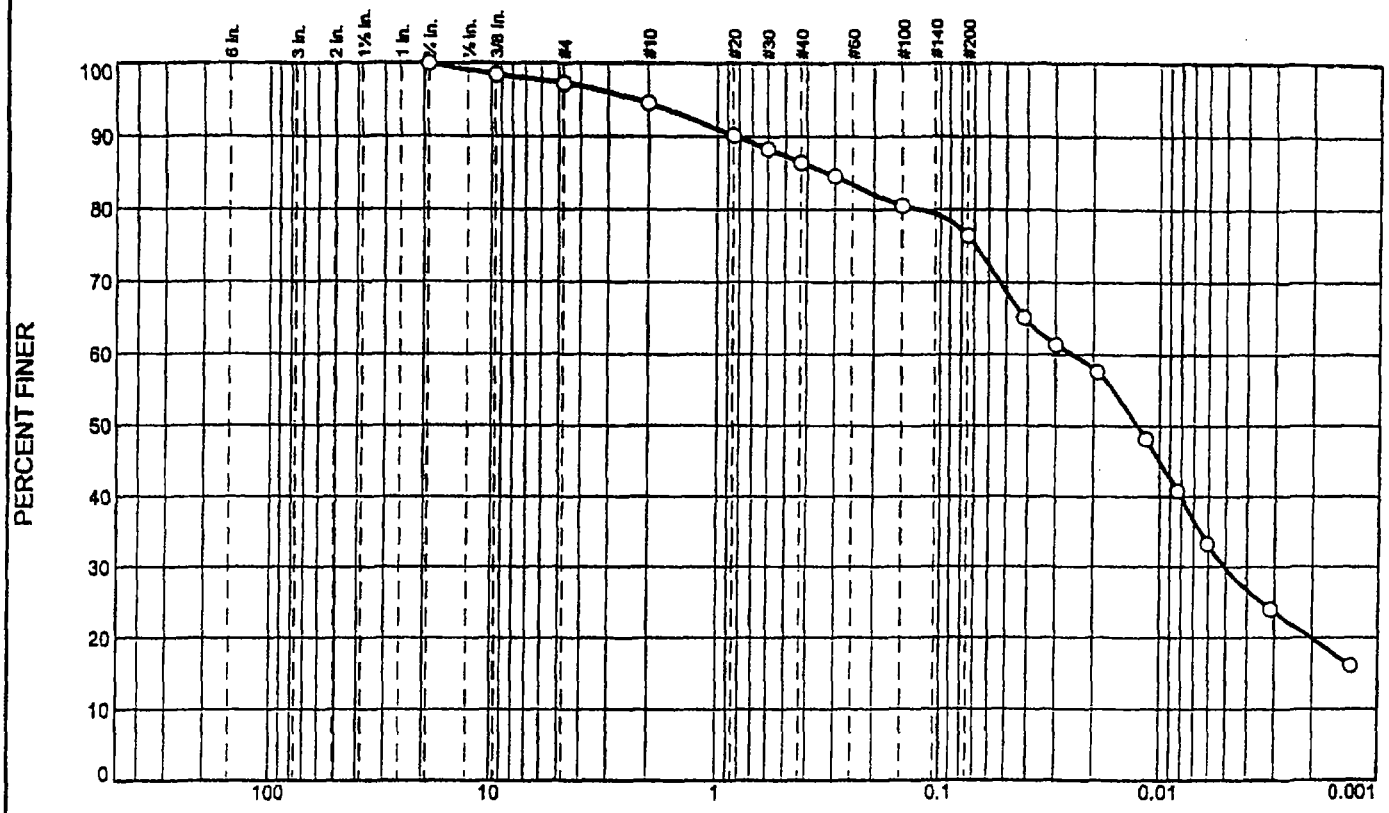
HULL & ASSOCIATES, INC.

Erie, MI

Client: TIERRA SOLUTIONS, INC.
Project: PAINESVILLE (CR CAP)

Project No: TIE-016 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.7	2.8	8.1	10.0	46.7	29.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	98.4		
#4	97.3		
#10	94.5		
#20	90.1		
#30	88.3		
#40	86.4		
#50	84.5		
#100	80.6		
#200	76.4		

* (no specification provided)

Material Description

06-033 6021 DEPTH: 2.0-4.0'
GREY LEAN CLAY WITH SAND

Atterberg Limits (ASTM D 4318)

PL= 17 LL= 28 PI= 11

Classification

USCS= CL AASHTO= A-6(6)

Coefficients

D_{85}= 0.3256 D_{60}= 0.0250 D_{50}= 0.0126
D_{30}= 0.0051 D_{15}= D_{10}=
C_u= C_c=

Date Tested: 2/17/06 **Tested By:** JL/MG/CG

Remarks

NATURAL MOISTURE: 12.3%

Sample No.: 06-033 **Source of Sample:** **Date Sampled:** 1-17-06
Location: 6021 **Elev./Depth:** 2.0-4.0'
Checked By: MIKE GERDEMAN **Title:** SENIOR TECHNICIAN

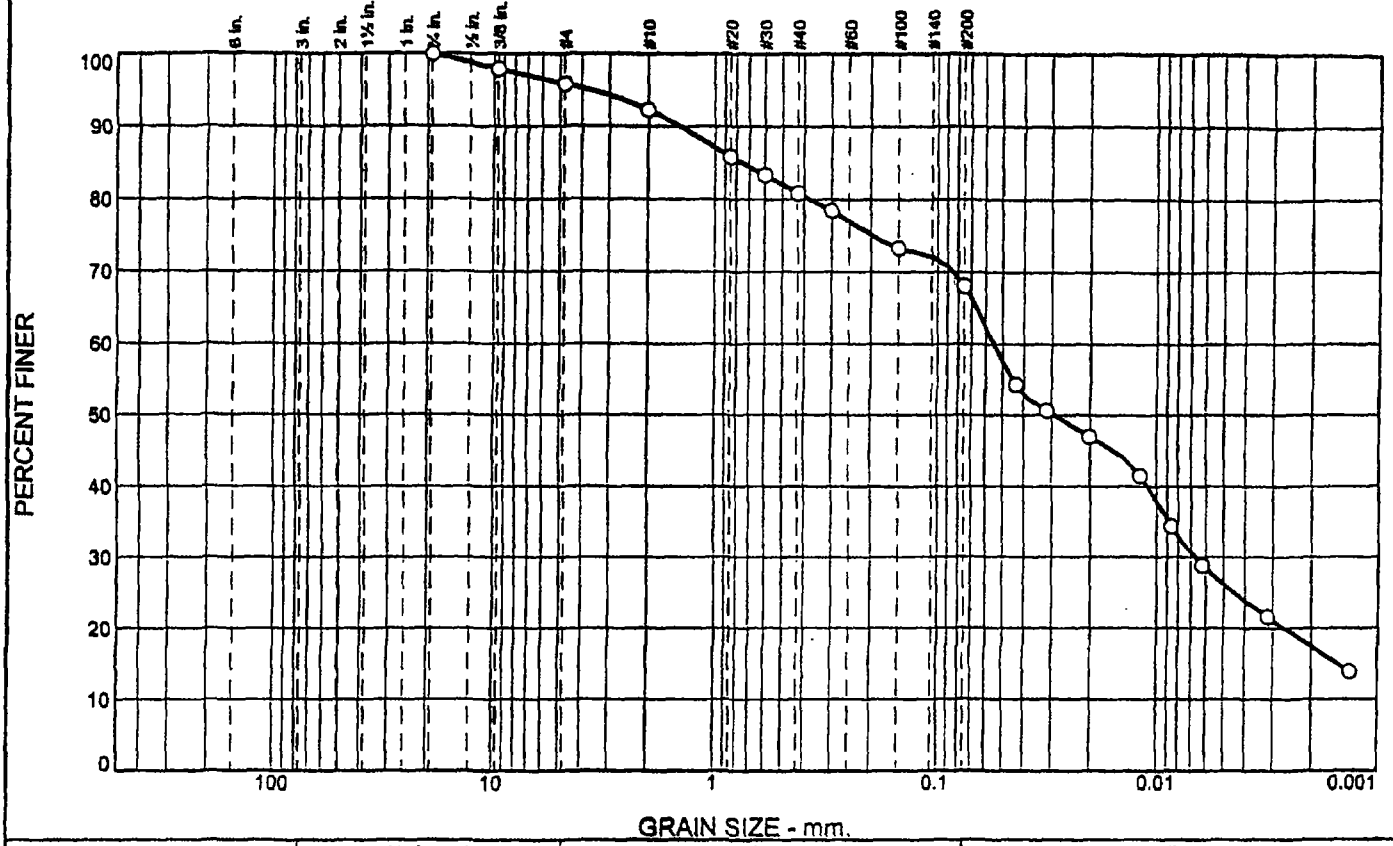
HULL & ASSOCIATES, INC.

Erie, MI

Client: TIERRA SOLUTIONS, INC.
Project: PAINESVILLE (CR CAP)

Project No: TIE-016 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.2	3.5	11.5	12.7	42.0	26.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	97.9		
#4	95.8		
#10	92.3		
#20	85.8		
#30	83.3		
#40	80.8		
#50	78.4		
#100	73.3		
#200	68.1		

* (no specification provided)

Material Description

06-035 6023 DEPTH: 0.5-2.0'
GREY SANDY LEAN CLAY

Atterberg Limits (ASTM D 4318)

PL= 17 LL= 27 PI= 10

Classification

USCS= CL AASHTO= A-4(4)

Coefficients

D_{85}= 0.7601 D_{60}= 0.0552 D_{50}= 0.0291
D_{30}= 0.0068 D_{15}= 0.0015 D_{10}=
C_u= C_c=

Date Tested: 2/17/06 **Tested By:** JL/MG/CG

Remarks

NATURAL MOISTURE: 13.5%

Sample No.: 06-035 **Source of Sample:** **Date Sampled:** 1-17-06
Location: 6023 **Elev./Depth:** 0.5-2.0'
Checked By: MIKE GERDEMAN **Title:** SENIOR TECHNICIAN

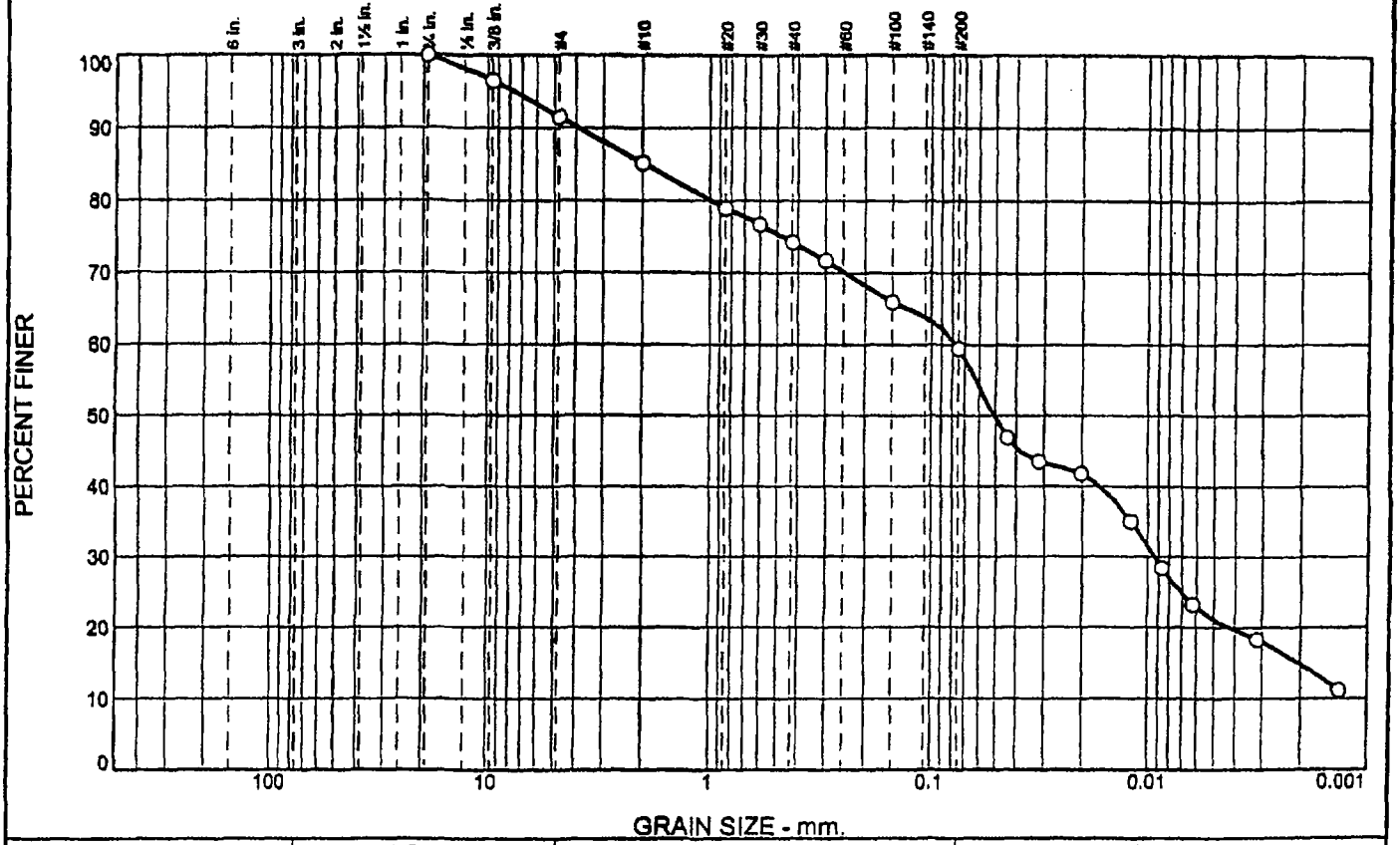
HULL & ASSOCIATES, INC.

Erie, MI

Client: TIERRA SOLUTIONS, INC.
Project: PAINESVILLE (CR CAP)

Project No: TIE-016 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	8.5	6.4	10.9	14.8	38.3	21.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	96.5		
#4	91.5		
#10	85.1		
#20	79.0		
#30	76.6		
#40	74.2		
#50	71.7		
#100	65.9		
#200	59.4		

* (no specification provided)

Material Description

06-038 6026 DEPTH: 0.6-2.0'
GREY SANDY LEAN CLAY

Atterberg Limits (ASTM D 4318)

PL= 15 LL= 25 PI= 10

Classification

USCS= CL AASHTO= A-4(3)

Coefficients

D_{85}= 1.9636 D_{60}= 0.0774 D_{50}= 0.0510
D_{30}= 0.0094 D_{15}= 0.0020 D_{10}=
C_u= C_c=

Date Tested: 2/17/06 **Tested By:** JL/MG/CG

Remarks

NATURAL MOISTURE: 12.2%

Sample No.: 06-038 **Source of Sample:** **Date Sampled:** 1-16-06
Location: 6026 **Elev./Depth:** 0.6-2.0'
Checked By: MIKE GERDEMAN **Title:** SENIOR TECHNICIAN

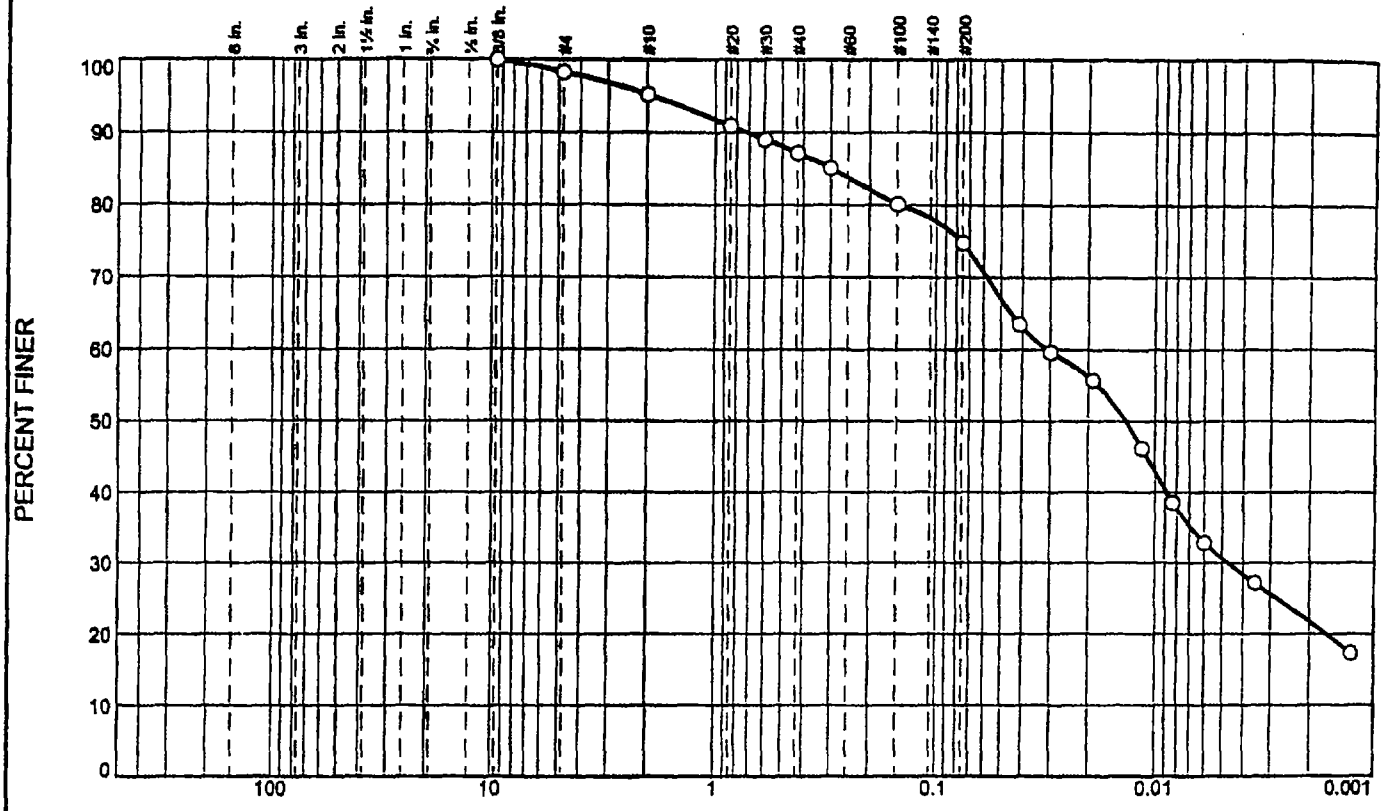
HULL & ASSOCIATES, INC.

Erie, MI

Client: TIERRA SOLUTIONS, INC.
Project: PAINESVILLE (CR CAP)

Project No: TIE-016 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.7	3.1	8.0	12.5	44.2	30.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	98.3		
#10	95.2		
#20	90.9		
#30	89.0		
#40	87.2		
#50	85.1		
#100	80.1		
#200	74.7		

* (no specification provided)

Material Description

06-046 6011 DEPTH: 0.5-2.5'
GREY LEAN CLAY WITH SAND

Atterberg Limits (ASTM D 4318)

PL= 17 LL= 30 PI= 13

Classification

USCS= CL AASHTO= A-6(8)

Coefficients

D_{85}= 0.2961 D_{60}= 0.0311 D_{50}= 0.0136
D_{30}= 0.0048 D_{15}= D_{10}=
C_u= C_c=

Date Tested: 2/17/06 **Tested By:** CG/MG

Remarks

NATURAL MOISTURE: 12.8%

Sample No.: 06-046 **Source of Sample:** **Date Sampled:** 1-20-06
Location: 6011 **Elev./Depth:** 0.5-2.5'
Checked By: MIKE GERDEMAN **Title:** SENIOR TECHNICIAN

HULL & ASSOCIATES, INC.

Erie, MI

Client: TIERRA SOLUTIONS, INC.
Project: PAINESVILLE (CR CAP)
Project No: TIE-016 **Figure**

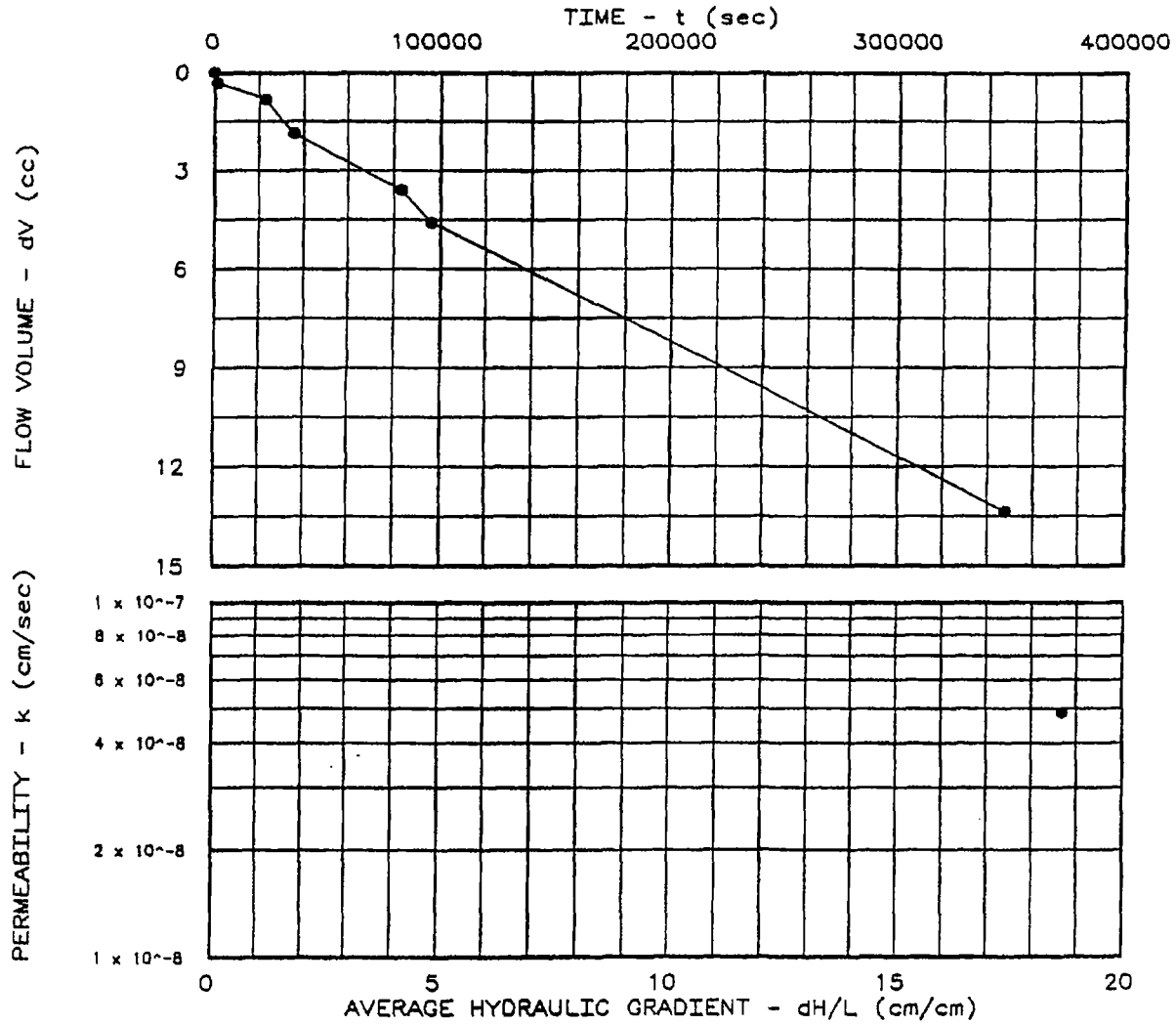
PERMEABILITY TEST REPORT

TEST DATA:

Specimen Height (cm): 8.27
Specimen Diameter (cm): 7.28
Dry Unit Weight (pcf): 122.5
Moisture Before Test (%): 13.4
Moisture After Test (%): 14.2
Run Number: 1 ● 2 ▲
Cell Pressure (psi): 35.0
Test Pressure(psi): 32.0
Back Pressure(psi): 29.8
Diff. Head (psi): 2.2
Flow Rate (cc/sec): 3.81 x 10^-5
Perm. (cm/sec): 4.86 x 10^-8

SAMPLE DATA:

Sample Identification: 6011
DEPTH: 0.5-2.5'
Visual Description: GREY LEAN CLAY WITH SAND
Remarks: PERMEANT:DEAIRED WATER ASTM D5084-METHOD A
Maximum Dry Density (pcf):
Optimum Moisture Content (%):
Percent Compaction:
Permeameter type: Flex Wall
Sample type: UNDISTURBED

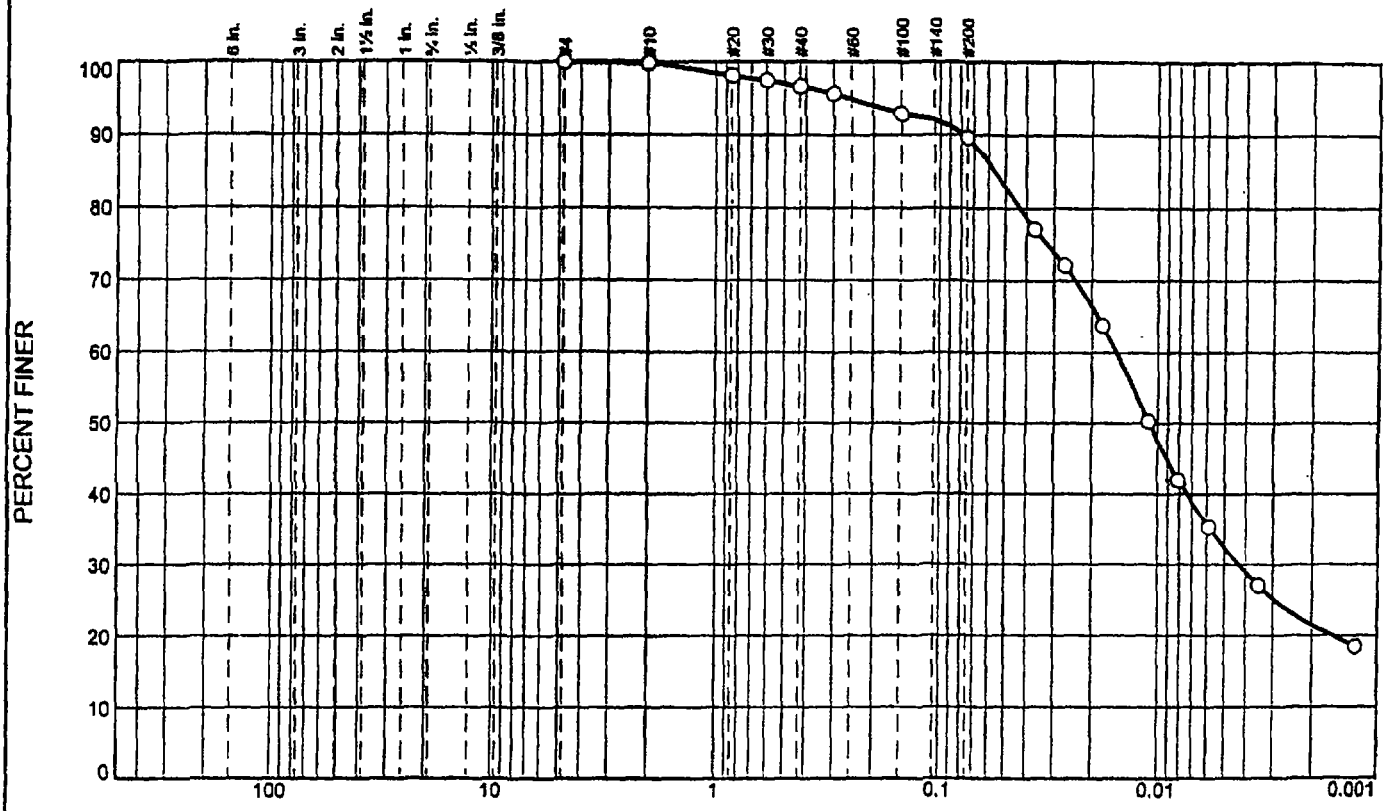


Project: TIERRA SOLUTIONS, INC. Location: PAINESVILLE (CR-CAP) Date: 2-9-06	Project No.: TIE-016 File No.: 30 Lab No.: 06-046 Tested by: MG Checked by: CG Test: CH - Constant head

PERMEABILITY TEST REPORT

HULL & ASSOCIATES, INC.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	3.2	7.0	57.2	32.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	98.1		
#30	97.4		
#40	96.6		
#50	95.6		
#100	92.9		
#200	89.6		

* (no specification provided)

Material Description

06-047 6009 DEPTH: 2.0-4.0'
BROWN/GREY LEAN CLAY

Atterberg Limits (ASTM D 4318)

PL= 26 LL= 47 PI= 21

Classification

USCS= CL AASHTO= A-7-6(21)

Coefficients

D_{85}= 0.0558 D_{60}= 0.0155 D_{50}= 0.0109
D_{30}= 0.0043 D_{15}= D_{10}=
C_u= C_c=

Date Tested: 2/17/06 **Tested By:** MG/CG

Remarks

NATURAL MOISTURE: 21.4%

Sample No.: 06-047 **Source of Sample:** **Date Sampled:** 1-20-06
Location: 6009 **Elev./Depth:** 2.0-4.0'
Checked By: MIKE GERDEMAN **Title:** SENIOR TECHNICIAN

HULL & ASSOCIATES, INC.
Erie, MI

Client: TIERRA SOLUTIONS, INC.
Project: PAINESVILLE (CR CAP)
Project No: TIE-016 **Figure**

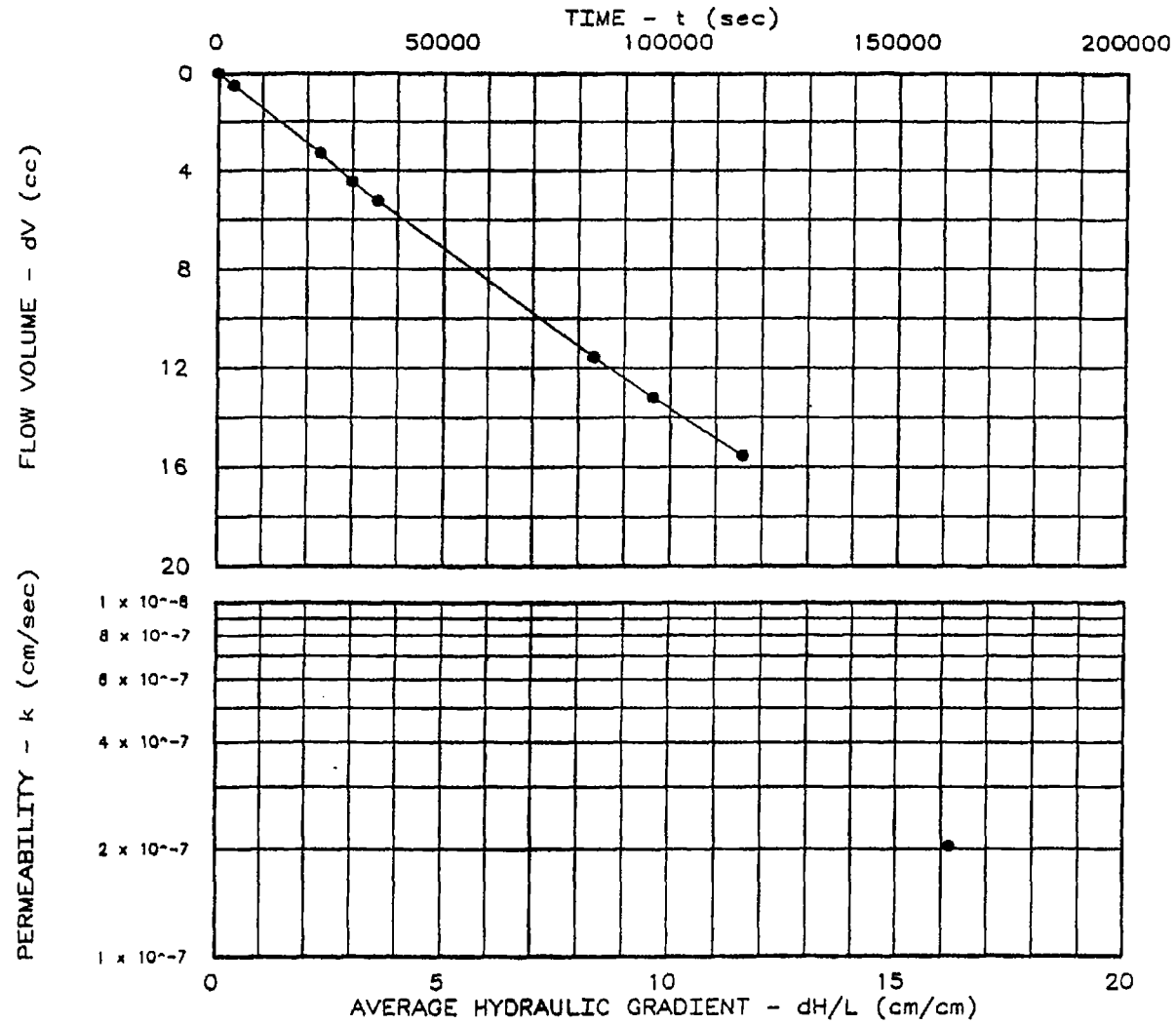
PERMEABILITY TEST REPORT

TEST DATA:
Specimen Height (cm): 9.16
Specimen Diameter (cm): 7.26
Dry Unit Weight (pcf): 109.5
Moisture Before Test (%): 19.6
Moisture After Test (%): 20.0
Run Number: 1 ● 2 ▲
Cell Pressure (psi): 35.0
Test Pressure(psi): 32.0
Back Pressure(psi): 29.9
Diff. Head (psi): 2.1
Flow Rate (cc/sec): 1.35 x 10^-4
Perm. (cm/sec): 2.04 x 10^-7

SAMPLE DATA:
Sample Identification: 6009
DEPTH: 2.0-4.0'
Visual Description: BROWN/GREY LEAN CLAY

Remarks: PERMEANT:DEAIRED WATER
ASTM D5084-METHOD A
Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: Flex Wall
Sample type: UNDISTURBED

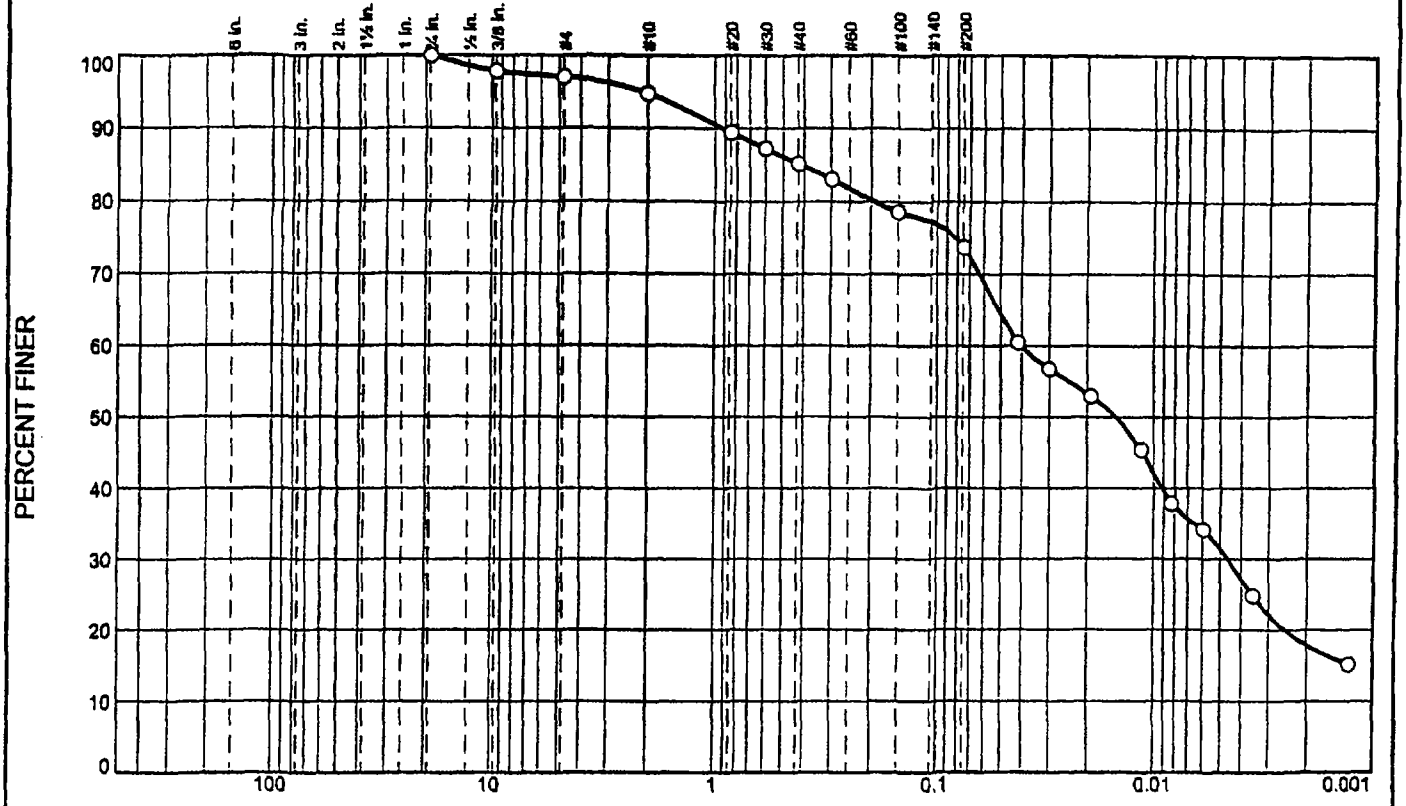


Project: TIERRA SOLUTIONS, INC.
Location: PAINESVILLE (CR-CAP)
Date: 2-10-06

PERMEABILITY TEST REPORT
HULL & ASSOCIATES, INC.

Project No.: TIE-016
File No.: 31
Lab No.: 06-047
Tested by: MG
Checked by: CG
Test: CH - Constant head

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.0	2.2	9.7	11.4	42.3	31.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	97.8		
#4	97.0		
#10	94.8		
#20	89.4		
#30	87.2		
#40	85.1		
#50	83.0		
#100	78.6		
#200	73.7		

* (no specification provided)

Material Description

06-048 6011 DEPTH: 0.5-2.5'
GREY/BROWN LEAN CLAY WITH SAND

Atterberg Limits (ASTM D 4318)

PL= 17 LL= 28 PI= 11

Classification

USCS= CL AASHTO= A-6(6)

Coefficients

D_{85}= 0.4167 D_{60}= 0.0405 D_{50}= 0.0149
D_{30}= 0.0046 D_{15}= D_{10}=
C_u= C_c=

Date Tested: 2/17/06 **Tested By:** MG/CG

Remarks

NATURAL MOISTURE: 11.1%

Sample No.: 06-048 **Source of Sample:** **Date Sampled:** 1-20-06
Location: 6011 **Elev./Depth:** 0.5-2.5'
Checked By: MIKE GERDEMAN **Title:** SENIOR TECHNICIAN

HULL & ASSOCIATES, INC.

Erie, MI

Client: TIERRA SOLUTIONS, INC.
Project: PAINESVILLE (CR CAP)

Project No: TIE-016 **Figure**

PERMEABILITY TEST REPORT

TEST DATA:

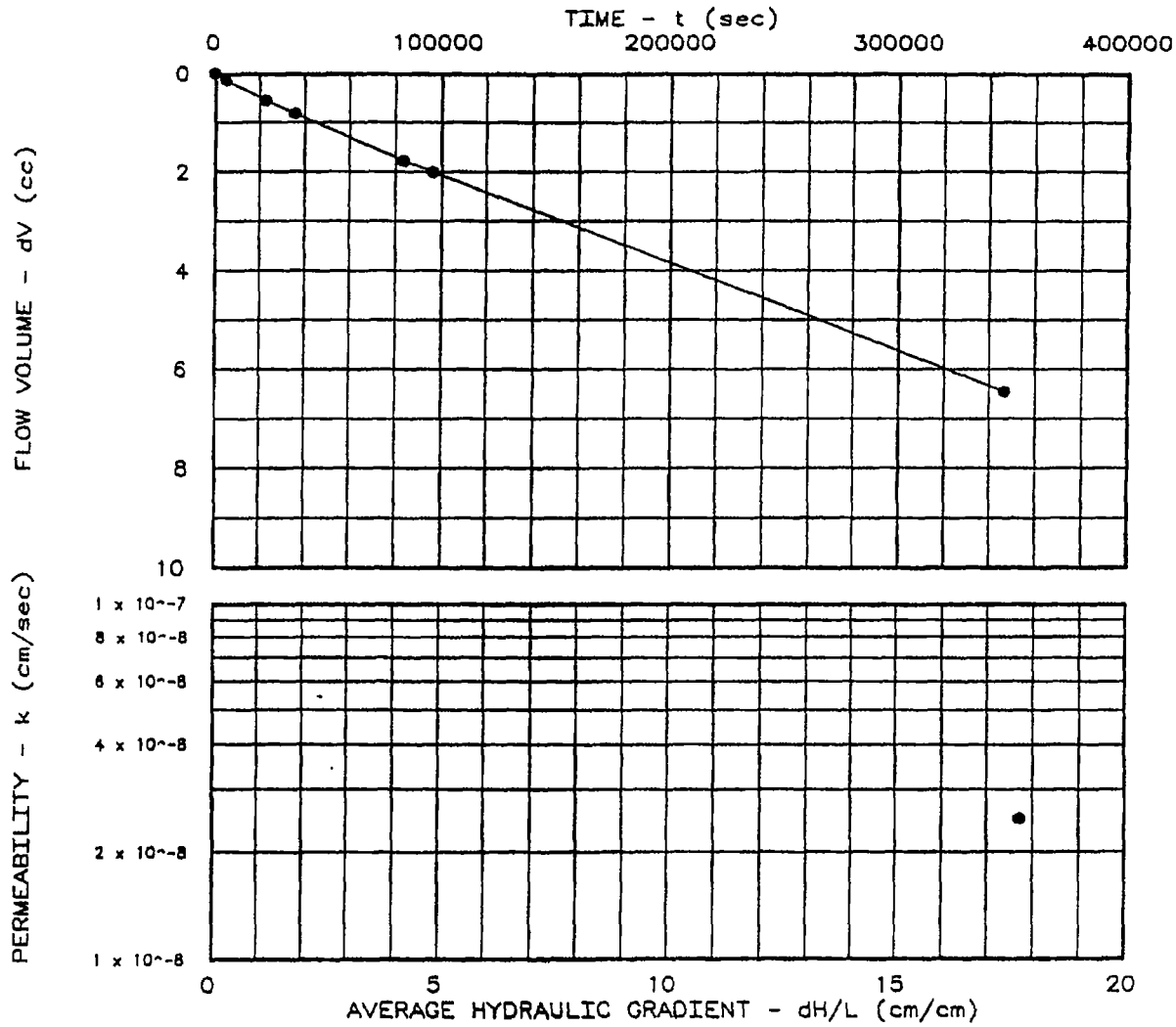
Specimen Height (cm): 8.93
Specimen Diameter (cm): 7.27
Dry Unit Weight (pcf): 128.3
Moisture Before Test (%): 11.4
Moisture After Test (%): 12.0

Run Number:	1 ●	2 ▲
Cell Pressure (psi):	35.0	
Test Pressure(psi):	32.0	
Back Pressure(psi):	29.8	
Diff. Head (psi):	2.2	
Flow Rate (cc/sec):	1.84 x 10^-5	
Perm. (cm/sec):	2.48 x 10^-8	

SAMPLE DATA:

Sample Identification: 6011
DEPTH: 0.5-2.5'
Visual Description: GREY/BROWN LEAN CLAY WITH SAND
Remarks: PERMEANT:DEAIRED WATER
ASTM D5084-METHOD A
Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: Flex Wall
Sample type: UNDISTURBED



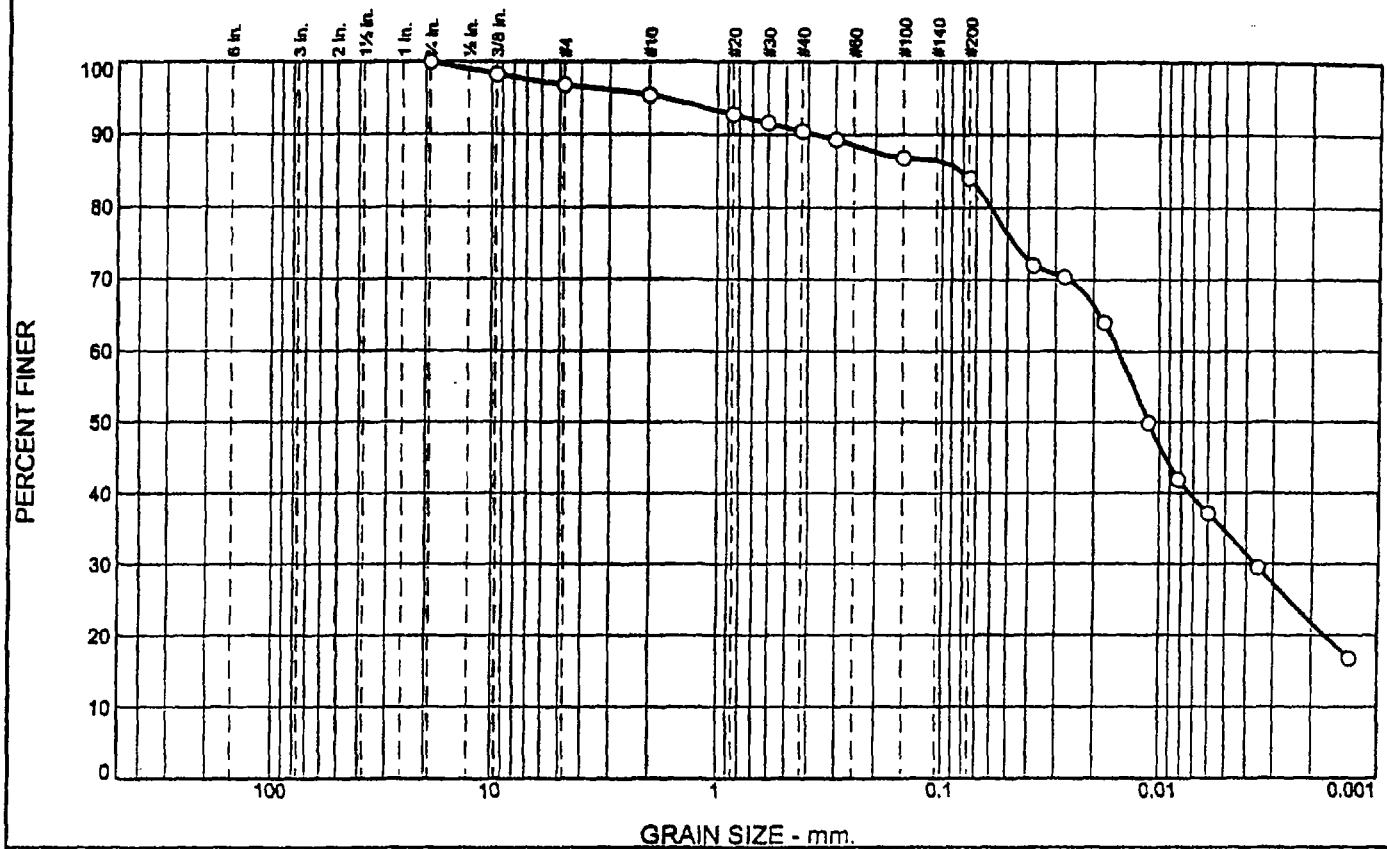
Project: TIERRA SOLUTIONS, INC.
Location: PAINESVILLE (CR-CAP)
Date: 2-10-06

Project No.: TIE-016
File No.: 32
Lab No.: 06-048
Tested by: MG
Checked by: CG
Test: CH - Constant head

PERMEABILITY TEST REPORT

HULL & ASSOCIATES, INC.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.2	1.4	5.0	6.4	49.4	34.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	98.3		
#4	96.8		
#10	95.4		
#20	92.8		
#30	91.6		
#40	90.4		
#50	89.3		
#100	86.8		
#200	84.0		

* (no specification provided)

Material Description

06-049 6017 DEPTH: 1.0-3.0'
GREY FRAC BROWN LEAN CLAY WITH SAND

Atterberg Limits (ASTM D 4318)

PL= 18 LL= 28 PI= 10

Classification

USCS= CL AASHTO= A-4(7)

Coefficients

D_{85}= 0.0814 D_{60}= 0.0155 D_{50}= 0.0113
D_{30}= 0.0037 D_{15}= D_{10}=
C_u= C_c=

Date Tested: 2/21/06 **Tested By:** MG/CG

Remarks

NATURAL MOISTURE: 13.9%

Sample No.: 06-049 **Source of Sample:** **Date Sampled:** 1-17-06
Location: 6017 **Elev./Depth:** 1.0-3.0'
Checked By: MIKE GERDEMAN **Title:** SENIOR TECHNICIAN

HULL & ASSOCIATES, INC.

Erie, MI

Client: TIERRA SOLUTIONS, INC.
Project: PAINESVILLE (CR CAP)

Project No: TIE-016 **Figure**

PERMEABILITY TEST REPORT

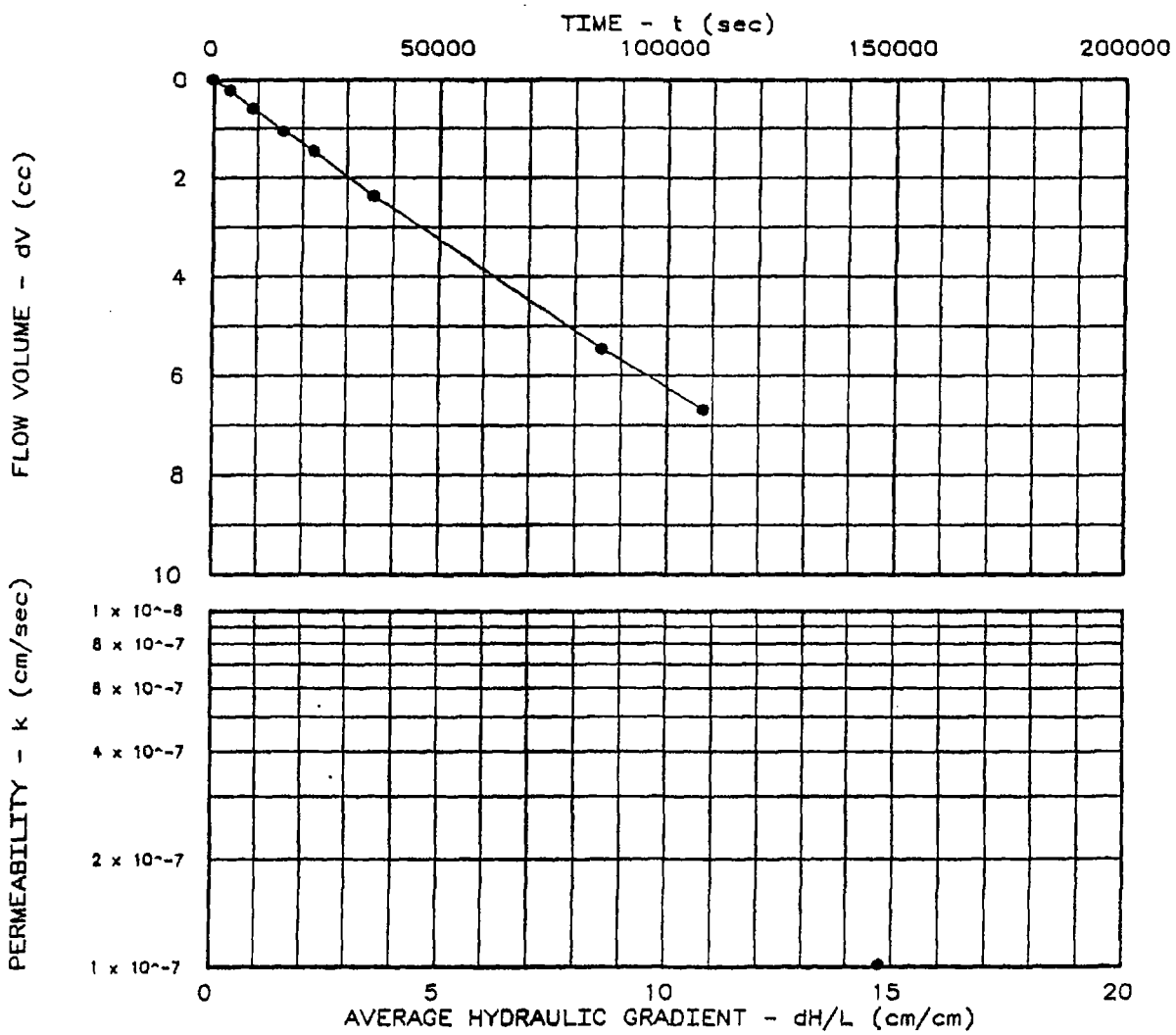
TEST DATA:

Specimen Height (cm): 10.68
Specimen Diameter (cm): 7.25
Dry Unit Weight (pcf): 120.9
Moisture Before Test (%): 14.4
Moisture After Test (%): 14.6
Run Number: 1 ● 2 ▲
Cell Pressure (psi): 35.0
Test Pressure(psi): 32.0
Back Pressure(psi): 29.8
Diff. Head (psi): 2.2
Flow Rate (cc/sec): 6.23 x 10^-5
Perm. (cm/sec): 1.02 x 10^-7

SAMPLE DATA:

Sample Identification: 6017
DEPTH: 1.0-3.0'
Visual Description: GREY FRAC BROWN LEAN CLAY WITH SAND
Remarks: PERMEANT:DEAIRED WATER ASTM D5084-METHOD A
Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: Flex Wall
Sample type: UNDISTURBED



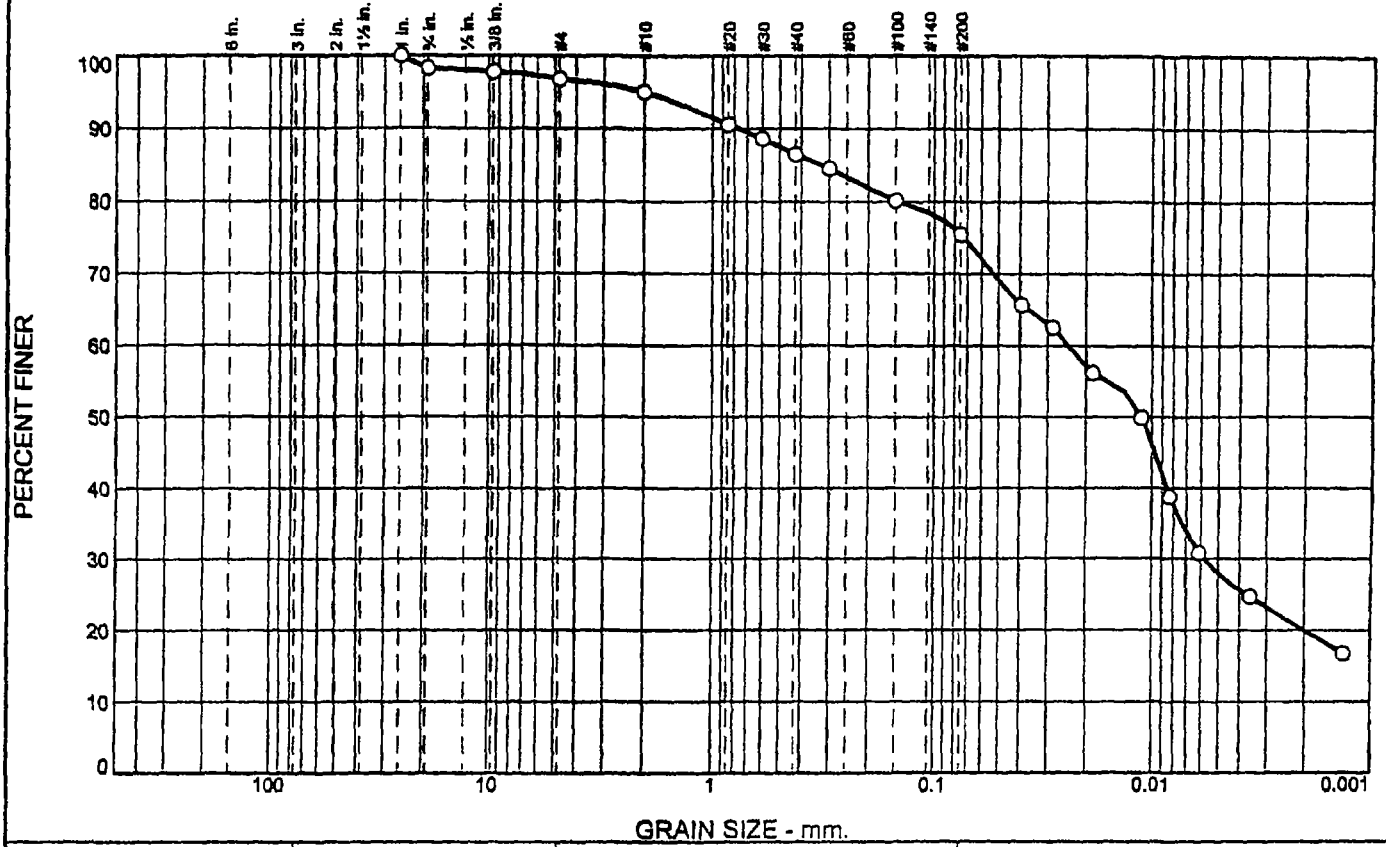
Project: TIERRA SOLUTIONS, INC.
Location: PAINESVILLE (CR-CAP)
Date: 2-15-06

PERMEABILITY TEST REPORT

HULL & ASSOCIATES, INC.

Project No.: TIE-016
File No.: 34
Lab No.: 06-049
Tested by: MG
Checked by: CG
Test: CH - Constant head

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.7	1.4	1.9	8.5	11.0	47.7	27.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	98.3		
.375	97.8		
#4	96.9		
#10	95.0		
#20	90.6		
#30	88.6		
#40	86.5		
#50	84.5		
#100	80.2		
#200	75.5		

* (no specification provided)

Material Description

06-050 6030 DEPTH: 1.0-3.0'
GREY FRAC BROWN LEAN CLAY WITH SAND

Atterberg Limits (ASTM D 4318)

PL= 18 LL= 29 PI= 11

Classification

USCS= CL AASHTO= A-6(7)

Coefficients

D_{85}= 0.3254 D_{60}= 0.0241 D_{50}= 0.0112
D_{30}= 0.0058 D_{15}= D_{10}=
C_u= C_c=

Date Tested: 2/21/06 **Tested By:** MG/CG

Remarks

NATURAL MOISTURE: 13.3%

Sample No.: 06-050 **Source of Sample:** **Date Sampled:** 1-17-06
Location: 6030 **Elev./Depth:** 1.0-3.0'
Checked By: MIKE GERDEMAN **Title:** SENIOR TECHNICIAN

HULL & ASSOCIATES, INC.

Erie, MI

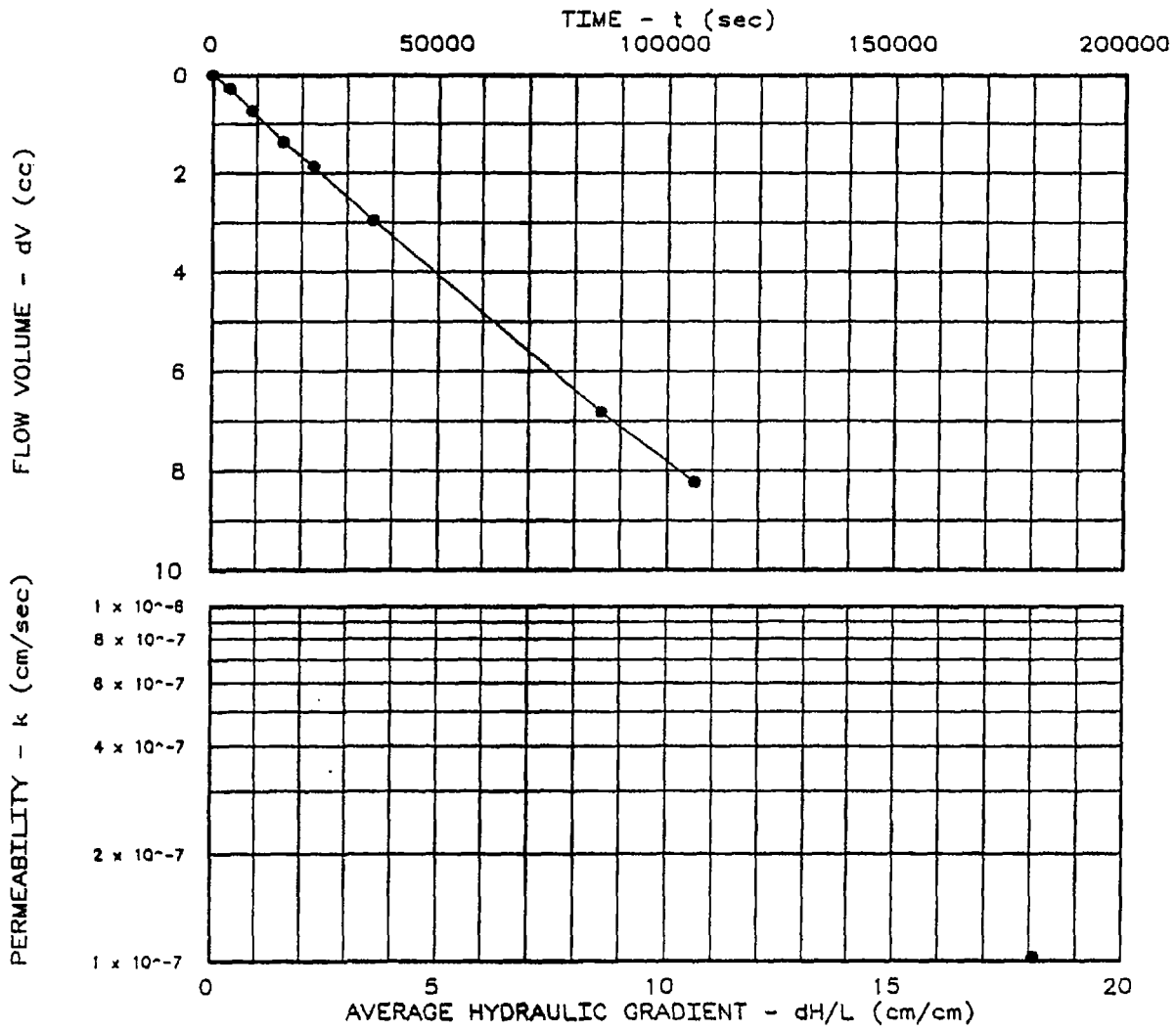
Client: TIERRA SOLUTIONS, INC.
Project: PAINESVILLE (CR CAP)

Project No: TIE-016 **Figure**

PERMEABILITY TEST REPORT

TEST DATA:
Specimen Height (cm): 8.64
Specimen Diameter (cm): 7.28
Dry Unit Weight (pcf): 118.8
Moisture Before Test (%): 15.3
Moisture After Test (%): 15.5
Run Number: 1 ● 2 ▲
Cell Pressure (psi): 35.0
Test Pressure(psi): 32.0
Back Pressure(psi): 29.8
Diff. Head (psi): 2.2
Flow Rate (cc/sec): 7.80 x 10^-5
Perm. (cm/sec): 1.03 x 10^-7

SAMPLE DATA:
Sample Identification: 6030
DEPTH: 1.0-3.0'
Visual Description: GREY FRAC BROWN LEAN CLAY WITH SAND
Remarks: PERMEANT:DEAIRED WATER ASTM D5084-METHOD A
Maximum Dry Density (pcf):
Optimum Moisture Content (%):
Percent Compaction:
Permeameter type: Flex Wall
Sample type: UNDISTURBED



Project: TIERRA SOLUTIONS, INC.
Location: PAINESVILLE (CR-CAP)
Date: 2-15-06

PERMEABILITY TEST REPORT

HULL & ASSOCIATES, INC.

Project No.: TIE-016
File No.: 33
Lab No.: 06-050
Tested by: MG
Checked by: CG
Test: CH - Constant head

ATTACHMENT B

Modified Proctor and Remolded Permeability Test Results

COMPACTION TEST REPORT

Project No.: TIE-016 **Date:** 2-24-06

Project: PAINESVILLE (CR CAP)

Location:

Elev./Depth: 0.5-4.0' **Sample No.** 06-162

Remarks: TESTED BY: MG
CHECKED BY: CG

MATERIAL DESCRIPTION

Description: 06-162 6006,6009,6011,6017,6030 COMPOSITE
GREY/BROWN LEAN CLAY WITH SAND (VISUAL)

Classifications - **USCS:** **AASHTO:**

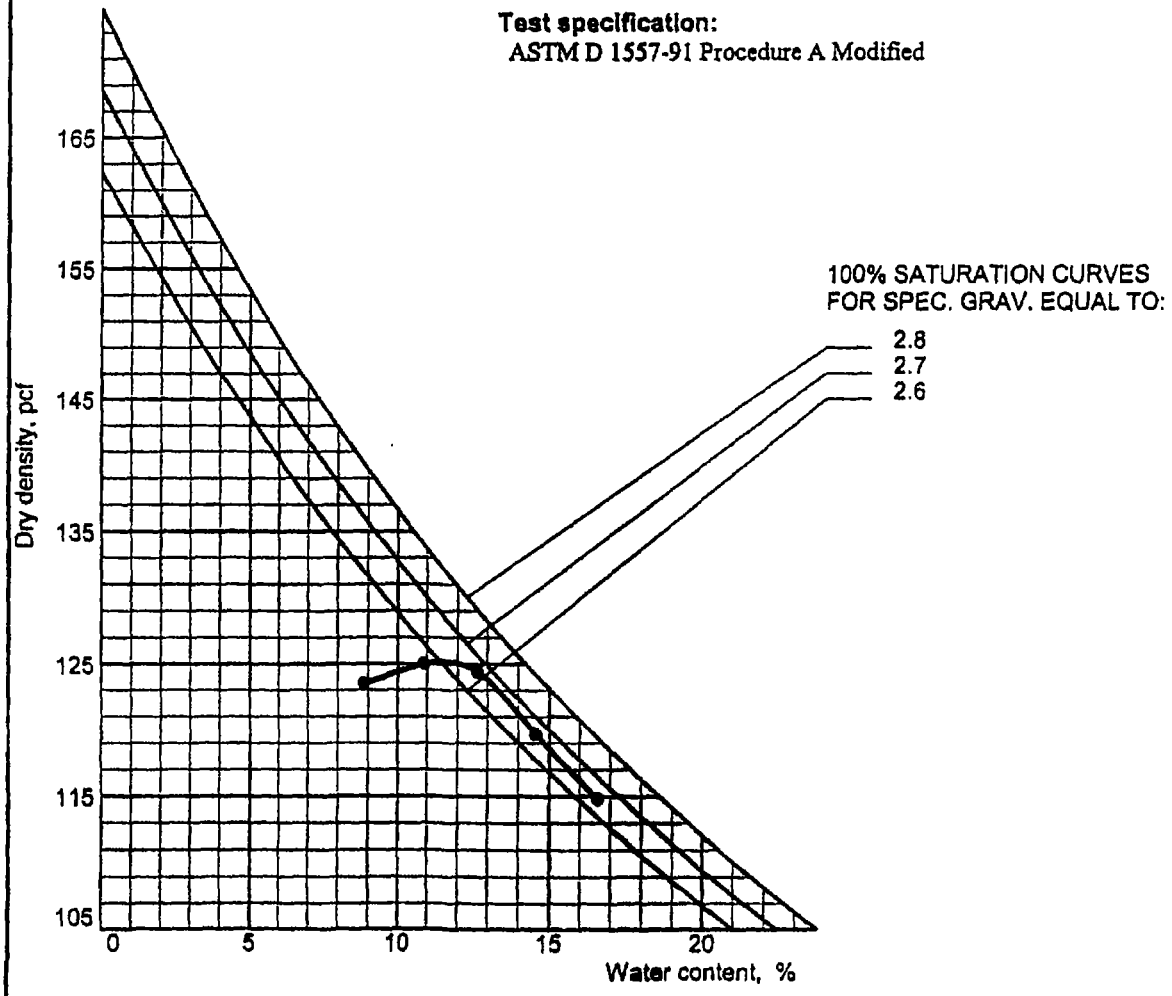
Nat. Moist. = **Sp.G. =** 2.70

Liquid Limit = **Plasticity Index =**

% > No.4 = % **% < No.200 =**

TEST RESULTS
Maximum dry density = 125.2 pcf
Optimum moisture = 11.5 %

Test specification:
ASTM D 1557-91 Procedure A Modified



Figure

HULL & ASSOCIATES, INC.

PERMEABILITY TEST REPORT

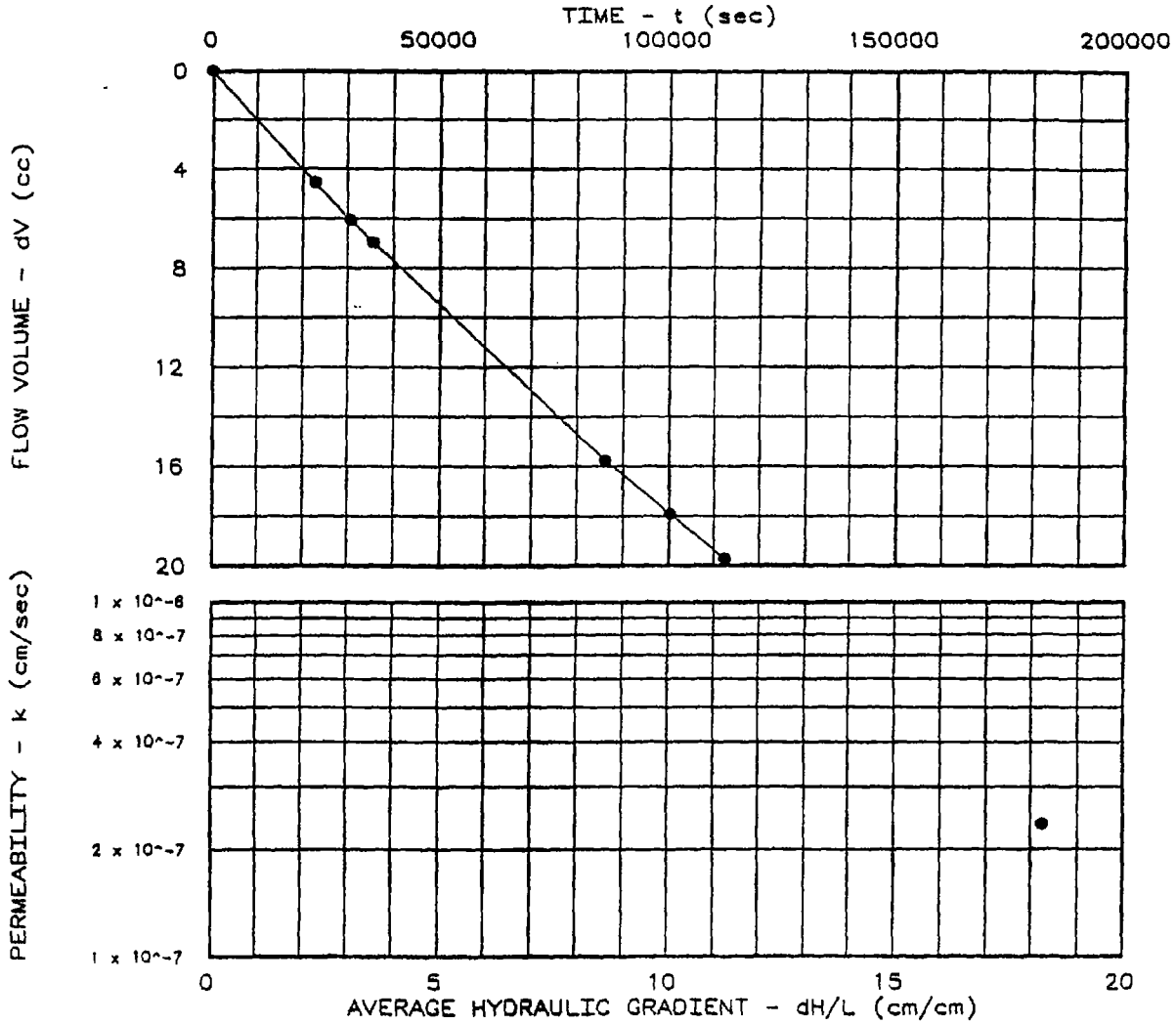
TEST DATA:

Specimen Height (cm): 7.71
Specimen Diameter (cm): 7.10
Dry Unit Weight (pcf): 113.1
Moisture Before Test (%): 12.5
Moisture After Test (%): 19.5

Run Number:	1 ●	2 ▲
Cell Pressure (psi):	45.0	
Test Pressure(psi):	42.0	
Back Pressure(psi):	40.0	
Diff. Head (psi):	2.0	
Flow Rate (cc/sec):	1.74 x 10^-4	
Perm. (cm/sec):	2.36 x 10^-7	

SAMPLE DATA:

Sample Identification: 6006,6009,6011,6017, 6030 COMPOSITE DEPTH: 0.5-4.0'
Visual Description: GREY/BROWN LEAN CLAY WITH SAND (VISUAL)
Remarks: PERMEANT:DEAIRED WATER ASTM D5084-METHOD A
Maximum Dry Density (pcf): 125.2
Optimum Moisture Content (%): 11.5 ASTM(D1557)
Percent Compaction: 90.3%
Permeameter type: Flex Wall
Sample type: REMOLDED



Project: TIERRA SOLUTIONS, INC.
Location: PAINESVILLE (CR-CAP)
Date: 2-25-06

Project No.: TIE-016
File No.: 36
Lab No.: 06-162
Tested by: MG
Checked by: CG
Test: CH - Constant head

PERMEABILITY TEST REPORT

HULL & ASSOCIATES, INC.

PERMEABILITY TEST REPORT

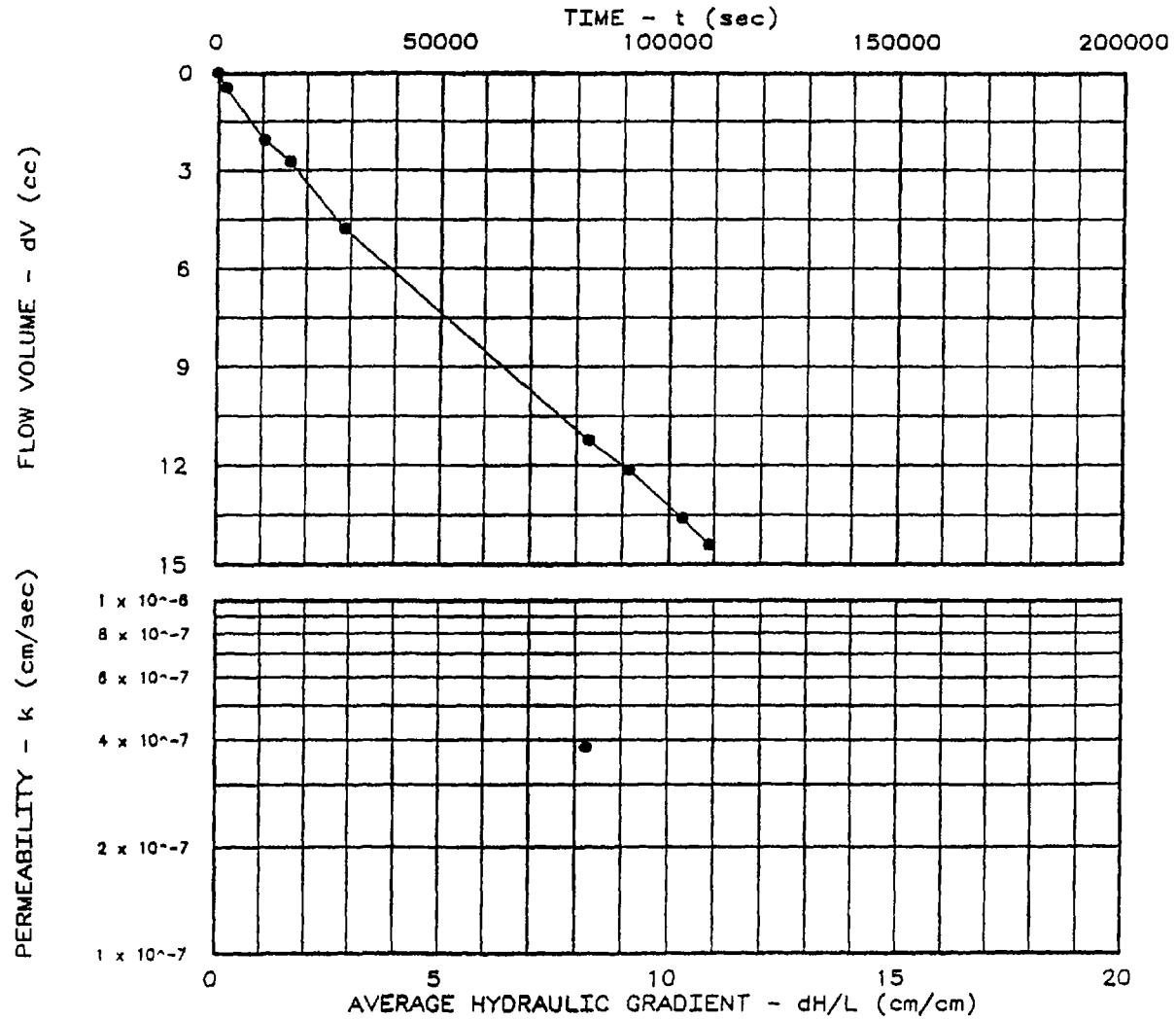
TEST DATA:

Specimen Height (cm): 9.14
Specimen Diameter (cm): 7.10
Dry Unit Weight (pcf): 116.3
Moisture Before Test (%): 11.5
Moisture After Test (%): 18.5

Run Number:	1 ●	2 ▲
Cell Pressure (psi):	45.0	
Test Pressure(psi):	41.0	
Back Pressure(psi):	39.9	
Diff. Head (psi):	1.1	
Flow Rate (cc/sec):	1.28 x 10^-4	
Perm. (cm/sec):	3.82 x 10^-7	

SAMPLE DATA:

Sample Identification: 6006,6009,6011,6017, 6030 COMPOSITE DEPTH: 0.5-4.0'
Visual Description: GREY/BROWN LEAN CLAY WITH SAND (VISUAL)
Remarks: PERMEANT:DEAIRED WATER ASTM D5084-METHOD A
Maximum Dry Density (pcf): 125.2
Optimum Moisture Content (%): 11.5 ASTM(D1557)
Percent Compaction: 92.9%
Permeameter type: Flex Wall
Sample type: REMOLDED



Project: TIERRA SOLUTIONS, INC.
Location: PAINESVILLE (CR-CAP)
Date: 2-25-06

Project No.: TIE-016
File No.: 37
Lab No.: 06-162
Tested by: MG
Checked by: CG
Test: CH - Constant head

PERMEABILITY TEST REPORT

HULL & ASSOCIATES, INC.

PERMEABILITY TEST REPORT

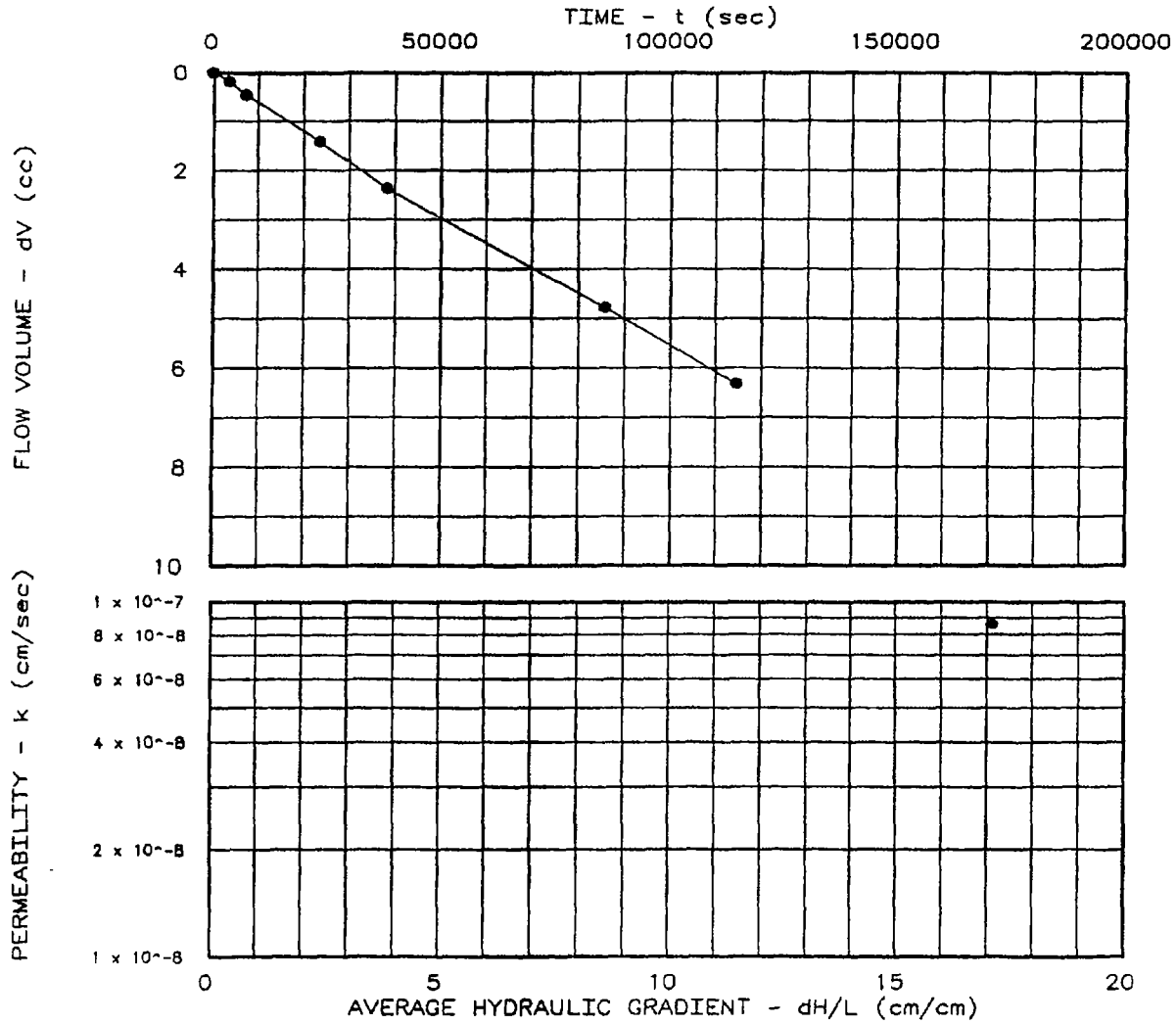
TEST DATA:

Specimen Height (cm): 9.18
Specimen Diameter (cm): 7.10
Dry Unit Weight (pcf): 118.8
Moisture Before Test (%): 11.5
Moisture After Test (%): 17.3

Run Number:	1 ●	2 ▲
Cell Pressure (psi):	50.0	
Test Pressure(psi):	47.0	
Back Pressure(psi):	44.8	
Diff. Head (psi):	2.2	
Flow Rate (cc/sec):	5.51 x 10^-5	
Perm. (cm/sec):	8.61 x 10^-8	

SAMPLE DATA:

Sample Identification: 6006, 6009, 6011, 6017, 6030 COMPOSITE D: 0.5-4.0'
Visual Description: GREY/BROWN LEAN CLAY WITH SAND (VISUAL)
Remarks: PERMEANT:DEAIRED WATER ASTM D5084-METHOD A
Maximum Dry Density (pcf): 125.2
Optimum Moisture Content (%): 11.5 ASTM(D1557)
Percent Compaction: 94.9%
Permeameter type: Flex Wall
Sample type: REMOLDED



Project: TIERRA SOLUTIONS, INC.
Location: PAINESVILLE-CR CAP
Date: 3-11-06

PERMEABILITY TEST REPORT

HULL & ASSOCIATES, INC.

Project No.: TIE-016
File No.: 39
Lab No.: 06-162
Tested by: MG
Checked by: CG
Test: CH - Constant head

APPENDIX B

Laboratory Analytical Data

Lancaster Laboratories
Where quality is a science.

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Type IV Inorganics Data Package
for
Tierra Solutions, Inc.

SDG# PNV88

Project: Painesville, OH
Soil and Water Samples
Collected on 01/19/06
Sample No. 4692565-4692572, 4693387

PA Cert. # 36-037
NY Cert. # 10670
NJ Cert. # PA011
NC Cert. # 521

Prepared by Jessica Baron KW030

Reviewed by Audrey McClure

Date 2-16-06

Lancaster Laboratories
Where quality is a science.
2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Table of Contents for SDG# PNV88

Lancaster Laboratories
Where quality is a science.
2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Sample Reference List for SDG Number PNV88 with a Data Package Type of IV-I

06101 - Tierra Solutions, Inc.
Project: Painesville, OH

Lab Sample Number	Lab Sample Code	Client Sample Description
4692565	6005-	TIE023:6005:S010030 Soil Sample
4692566	6020-	TIE023:6020:S010030 Soil Sample
4692567	6014-	TIE023:6014:S010030 Soil Sample
4692568	6007-	TIE023:6007:S010030 Soil Sample
4692569	6024-	TIE023:6024:S010030 Soil Sample
4692570	6028-	TIE023:6028:S010050 Soil Sample
4692571	6008-	TIE023:6008:S005020 Soil Sample
4692572	6010-	TIE023:6010:S005025 Soil Sample
4693387	EB1J-	TIE023:EB1:W012006 Grab Water Sample

Lancaster Laboratories
Where quality is a science.
2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

METHODOLOGY SUMMARY/REFERENCE

0371 ICP Metals/ICP Metals by Trace Analyzer (water/soil)

The solution resulting from the metals digestion is analyzed by ICP/Trace ICP.

Reference: USEPA Contract Program
Statement of Work for Inorganic Analysis;
April 1994 (ILM04.0) Method 200.7

****

0159 Mercury (solids)

The solution resulting from the mercury digestion is analyzed by Cold Vapor AA.

Reference: USEPA CLP ILM04.0, Method 245.5
NIOSH Manual of Analytical Methods, 6009
(May 15,1989)

****

0494 Mercury Digestion (solids, CLP)

The sample is heated at 95C with nitric acid, sulfuric acid, potassium persulfate and potassium permanganate. Excess potassium permanganate is reduced with sodium chloride/hydroxylamine hydrochloride. Mercuric ions are reduced to mercury metal using stannous chloride.

Reference: USEPA ILM04.0, Method 245.5

****

1849 Metals Digestion - Solids

The organic material is oxidized and the metals dissolved with nitric acid, hydrogen peroxide, and hydrochloric acid.

Reference: SOW ILM04.0

Lancaster Laboratories
Where quality is a science.
2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

5909 CLP Cyanide Solid Distillation, Manual Distillation CLP

The sample is acidified and distilled. Cyanide is released as hydrogen cyanide and is absorbed in a sodium hydroxide solution.

Reference: USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, ILM04.0

****

5910 Total Cyanide CLP (solid) USEPA CLP

During the distillation step, complex cyanides are converted to hydrogen cyanide which readily reacts with chloramine T. Simple cyanides are converted to cyanogen chloride by reaction with chloramine T. This reacts with pyridine and barbituric acid to give a red colored complex with maximum light absorption at 570 nm. An autoanalyzer is used.

Reference: USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, ILM04.0

****

0259 Mercury (water)

The solution resulting from the mercury digestion is analyzed by Cold Vapor AA.

Reference: USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, ILM04.0

****

0821 Mercury Digestion (water)

The sample is heated at 95C with nitric acid, sulfuric acid, potassium persulfate and potassium permanganate. Excess potassium permanganate is reduced with sodium chloride/hydroxylamine hydrochloride. Mercuric ions are reduced to mercury metal using stannous chloride.

Reference: USEPA ILMO4.0, Method 245.2 [automated - primary] or Method 245.1 [manual - backup only]

****

5720 Metals Digestion (water, CLP)

The sample is digested with nitric and hydrochloric acids.

Reference: USEPA ILMO4.0

Lancaster Laboratories
Where quality is a science.
2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

3343 Total Cyanide (water)

During the distillation step, complex cyanides are converted to hydrogen cyanide which readily reacts with chloramine T. Simple cyanides are converted to cyanogen chloride by reaction with chloramine T. This reacts with pyridine and barbituric acid to give a red colored complex with maximum light absorption at 570 nm. An autoanalyzer is used.

Reference: USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, March 1990, Exhibit D, Section IV, Part E

****

3344 Cyanide Distillation (water)

The sample is acidified and distilled. Cyanide is released as hydrogen cyanide and is absorbed in a sodium hydroxide solution.

Reference: USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, March 1990, Exhibit D, Section III, Part D

Case Narrative
Conformance/Nonconformance Summary

Lancaster Laboratories

Where quality is a science.

CASE NARRATIVE FOR INORGANICS

Laboratory Name: Lancaster Laboratories

SDG Number: PNV88

Date Received: 01/21/2006

Explanatory Notes:

The chains of custody for the cyanide distillations could not be located at the time this data package was sent. The internal chain, showing that the samples were signed out for preparation, is included with this data package.

Calibration Standards:

Instrument calibration standards are prepared monthly from stock solutions purchased from Aldrich Chemical, EM Science, Fisher Scientific, High Purity, Inorganic Ventures, JT Baker, Spex Industries Inc., Ultra Scientific, or VHG Laboratories.

Case Narrative reviewed and approved by:

Betsy S. Menefee Date 2/17/06

Betsy S. Menefee, Senior Specialist
Inorganic Analysis

0886

U.S. EPA - CLP

COVER PAGE - INORGANIC ANALYSES DATA PACKAGE

Lab Name: LANCASTER_LABORATORIES_ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: PNV88

SOW No.: ILM04.0

EPA Sample No.	Lab Sample ID.
6005-	4692565
6007-	4692568
6008-	4692571
6010-	4692572
6014-	4692567
6020-	4692566
6024-	4692569
6028-	4692570
EB1J-	4693387

Were ICP interelement corrections applied? Yes/No YES___

Were ICP background corrections applied? Yes/No YES___

If yes, were raw data generated before application of background corrections? Yes/No NO___

Comments:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: Betsy S. Menefee Name: Betsy S. Menefee

Date: 2/15/06 Title: Senior Specialist Inorganic Analysis

Sample Data

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

6005-

Lab Name: LANCASTER_LABORATORIES Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: PNV88

Matrix: (soil/water) SOIL Lab Sample ID: 4692565

Level: (low/med) LOW Date Received: 01/20/06

% Solids: 88.0

Concentration Units (**ug/L** or **mg/kg** dry weight): MG/KG__

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10700			P
7440-36-0	Antimony	1.7	U	N	P
7440-38-2	Arsenic	10.7		N	P
7440-39-3	Barium	84.8			P
7440-41-7	Beryllium	0.56	B		P
7440-43-9	Cadmium	0.15	U		P
7440-70-2	Calcium	32200			P
7440-47-3	Chromium	16.9			P
7440-48-4	Cobalt	13.1			P
7440-50-8	Copper	26.9			P
7439-89-6	Iron	29400			P
7439-92-1	Lead	15.5			P
7439-95-4	Magnesium	11100		*	P
7439-96-5	Manganese	560			P
7439-97-6	Mercury	0.023	U		CV
7440-02-0	Nickel	32.7			P
7440-09-7	Potassium	2130			P
7782-49-2	Selenium	0.94	U		P
7440-22-4	Silver	0.48	B		P
7440-23-5	Sodium	175	B		P
7440-28-0	Thallium	2.9			P
7440-62-2	Vanadium	17.0			P
7440-66-6	Zinc	72.2			P
57-12-5	Cyanide	0.21	U		CA

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

6007-

Lab Name: LANCASTER_LABORATORIES Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: PNV88

Matrix: (soil/water) SOIL Lab Sample ID: 4692568

Level: (low/med) LOW Date Received: 01/20/06

% Solids: 88.6

Concentration Units (**ug/L** or **mg/kg** dry weight): MG/KG__

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10700			P
7440-36-0	Antimony	1.7	U	N	P
7440-38-2	Arsenic	12.4		N	P
7440-39-3	Barium	71.2			P
7440-41-7	Beryllium	0.54	B		P
7440-43-9	Cadmium	0.15	U		P
7440-70-2	Calcium	23300			P
7440-47-3	Chromium	17.1			P
7440-48-4	Cobalt	12.8			P
7440-50-8	Copper	25.1			P
7439-89-6	Iron	30900			P
7439-92-1	Lead	14.9			P
7439-95-4	Magnesium	9180		*	P
7439-96-5	Manganese	369			P
7439-97-6	Mercury	0.022	U		CV
7440-02-0	Nickel	32.2			P
7440-09-7	Potassium	2020			P
7782-49-2	Selenium	0.96	U		P
7440-22-4	Silver	0.28	B		P
7440-23-5	Sodium	190	B		P
7440-28-0	Thallium	2.1	U		P
7440-62-2	Vanadium	15.2			P
7440-66-6	Zinc	73.0			P
57-12-5	Cyanide	0.22	U		CA

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

6008-

Lab Name: LANCASTER_LABORATORIES Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: PNV88

Matrix: (soil/water) SOIL Lab Sample ID: 4692571

Level: (low/med) LOW Date Received: 01/20/06

% Solids: 86.2

Concentration Units (**ug/L** or **mg/kg** dry weight): MG/KG__

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	11700			P
7440-36-0	Antimony	1.7	U	N	P
7440-38-2	Arsenic	13.8		N	P
7440-39-3	Barium	77.6			P
7440-41-7	Beryllium	0.60	B		P
7440-43-9	Cadmium	0.15	U		P
7440-70-2	Calcium	24800			P
7440-47-3	Chromium	18.7			P
7440-48-4	Cobalt	14.7			P
7440-50-8	Copper	27.2			P
7439-89-6	Iron	33800			P
7439-92-1	Lead	16.3			P
7439-95-4	Magnesium	9940		*	P
7439-96-5	Manganese	380			P
7439-97-6	Mercury	0.023	U		CV
7440-02-0	Nickel	36.5			P
7440-09-7	Potassium	2240			P
7782-49-2	Selenium	0.97	U		P
7440-22-4	Silver	0.44	B		P
7440-23-5	Sodium	167	B		P
7440-28-0	Thallium	2.2	U		P
7440-62-2	Vanadium	17.0			P
7440-66-6	Zinc	76.5			P
57-12-5	Cyanide	0.22	U		CA

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

[redacted]

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

6010-

Lab Name: LANCASTER_LABORATORIES Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: PNV88

Matrix: (soil/water) SOIL Lab Sample ID: 4692572

Level: (low/med) LOW Date Received: 01/20/06

% Solids: 86.8

Concentration Units (**ug/L** or **mg/kg** dry weight): MG/KG__

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10800			P
7440-36-0	Antimony	1.7	U	N	P
7440-38-2	Arsenic	11.2		N	P
7440-39-3	Barium	65.3			P
7440-41-7	Beryllium	0.55	B		P
7440-43-9	Cadmium	0.15	U		P
7440-70-2	Calcium	19900			P
7440-47-3	Chromium	24.1			P
7440-48-4	Cobalt	12.2			P
7440-50-8	Copper	28.4			P
7439-89-6	Iron	29400			P
7439-92-1	Lead	15.3			P
7439-95-4	Magnesium	7690		*	P
7439-96-5	Manganese	365			P
7439-97-6	Mercury	0.022	U		CV
7440-02-0	Nickel	31.2			P
7440-09-7	Potassium	1830			P
7782-49-2	Selenium	0.98	U		P
7440-22-4	Silver	0.17	B		P
7440-23-5	Sodium	159	B		P
7440-28-0	Thallium	2.1	U		P
7440-62-2	Vanadium	15.7			P
7440-66-6	Zinc	73.9			P
57-12-5	Cyanide	0.22	U		CA

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

0012

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

6014-

Lab Name: LANCASTER_LABORATORIES Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: PNV88

Matrix: (soil/water) SOIL Lab Sample ID: 4692567

Level: (low/med) LOW Date Received: 01/20/06

% Solids: 87.5

Concentration Units (**ug/L** or **mg/kg** dry weight): MG/KG__

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10600			P
7440-36-0	Antimony	1.7	U	N	P
7440-38-2	Arsenic	14.1		N	P
7440-39-3	Barium	57.8			P
7440-41-7	Beryllium	0.54	B		P
7440-43-9	Cadmium	0.15	U		P
7440-70-2	Calcium	23300			P
7440-47-3	Chromium	16.8			P
7440-48-4	Cobalt	12.8			P
7440-50-8	Copper	26.3			P
7439-89-6	Iron	32500			P
7439-92-1	Lead	16.3			P
7439-95-4	Magnesium	9360		*	P
7439-96-5	Manganese	367			P
7439-97-6	Mercury	0.022	U		CV
7440-02-0	Nickel	33.1			P
7440-09-7	Potassium	1960			P
7782-49-2	Selenium	0.97	U		P
7440-22-4	Silver	0.23	B		P
7440-23-5	Sodium	171	B		P
7440-28-0	Thallium	2.2	U		P
7440-62-2	Vanadium	15.6			P
7440-66-6	Zinc	86.8			P
57-12-5	Cyanide	0.22	U		CA

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

8813

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

6020-

Lab Name: LANCASTER_LABORATORIES Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: PNV88

Matrix: (soil/water) SOIL Lab Sample ID: 4692566

Level: (low/med) LOW Date Received: 01/20/06

% Solids: 86.0

Concentration Units (**ug/L** or **mg/kg** dry weight): MG/KG__

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	11700			P
7440-36-0	Antimony	1.8	U	N	P
7440-38-2	Arsenic	12.5		N	P
7440-39-3	Barium	72.9			P
7440-41-7	Beryllium	0.59	B		P
7440-43-9	Cadmium	0.15	U		P
7440-70-2	Calcium	21800			P
7440-47-3	Chromium	18.7			P
7440-48-4	Cobalt	13.8			P
7440-50-8	Copper	25.4			P
7439-89-6	Iron	32900			P
7439-92-1	Lead	15.9			P
7439-95-4	Magnesium	9030		*	P
7439-96-5	Manganese	362			P
7439-97-6	Mercury	0.021	U		CV
7440-02-0	Nickel	35.6			P
7440-09-7	Potassium	2110			P
7782-49-2	Selenium	1.0	U		P
7440-22-4	Silver	0.30	B		P
7440-23-5	Sodium	157	B		P
7440-28-0	Thallium	2.2	U		P
7440-62-2	Vanadium	16.5			P
7440-66-6	Zinc	79.8			P
57-12-5	Cyanide	0.22	U		CA

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

8814

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

6024-

Lab Name: LANCASTER_LABORATORIES Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: PNV88

Matrix: (soil/water) SOIL Lab Sample ID: 4692569

Level: (low/med) LOW Date Received: 01/20/06

% Solids: 86.3

Concentration Units (**ug/L** or **mg/kg** dry weight): MG/KG__

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	11200			P
7440-36-0	Antimony	1.7	U	N	P
7440-38-2	Arsenic	16.2		N	P
7440-39-3	Barium	56.3			P
7440-41-7	Beryllium	0.54	B		P
7440-43-9	Cadmium	0.15	U		P
7440-70-2	Calcium	23500			P
7440-47-3	Chromium	17.9			P
7440-48-4	Cobalt	15.5			P
7440-50-8	Copper	29.1			P
7439-89-6	Iron	34900			P
7439-92-1	Lead	17.5			P
7439-95-4	Magnesium	10400		*	P
7439-96-5	Manganese	393			P
7439-97-6	Mercury	0.022	U		CV
7440-02-0	Nickel	36.4			P
7440-09-7	Potassium	1990			P
7782-49-2	Selenium	0.99	U		P
7440-22-4	Silver	0.32	B		P
7440-23-5	Sodium	247	B		P
7440-28-0	Thallium	2.2	U		P
7440-62-2	Vanadium	16.3			P
7440-66-6	Zinc	75.7			P
57-12-5	Cyanide	0.22	U		CA

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

8815

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

6028-

Lab Name: LANCASTER_LABORATORIES Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: PNV88

Matrix: (soil/water) SOIL Lab Sample ID: 4692570

Level: (low/med) LOW Date Received: 01/20/06

% Solids: 86.7

Concentration Units (**ug/L** or **mg/kg** dry weight): MG/KG__

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10700			P
7440-36-0	Antimony	1.7	U	N	P
7440-38-2	Arsenic	15.8		N	P
7440-39-3	Barium	52.8			P
7440-41-7	Beryllium	0.53	B		P
7440-43-9	Cadmium	0.15	U		P
7440-70-2	Calcium	26800			P
7440-47-3	Chromium	17.5			P
7440-48-4	Cobalt	13.4			P
7440-50-8	Copper	27.4			P
7439-89-6	Iron	32800			P
7439-92-1	Lead	15.7			P
7439-95-4	Magnesium	11100		*	P
7439-96-5	Manganese	391			P
7439-97-6	Mercury	0.020	U		CV
7440-02-0	Nickel	33.8			P
7440-09-7	Potassium	1900			P
7782-49-2	Selenium	0.99	U		P
7440-22-4	Silver	0.31	B		P
7440-23-5	Sodium	191	B		P
7440-28-0	Thallium	2.2	U		P
7440-62-2	Vanadium	16.3			P
7440-66-6	Zinc	74.5			P
57-12-5	Cyanide	0.22	U		CA

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

0016